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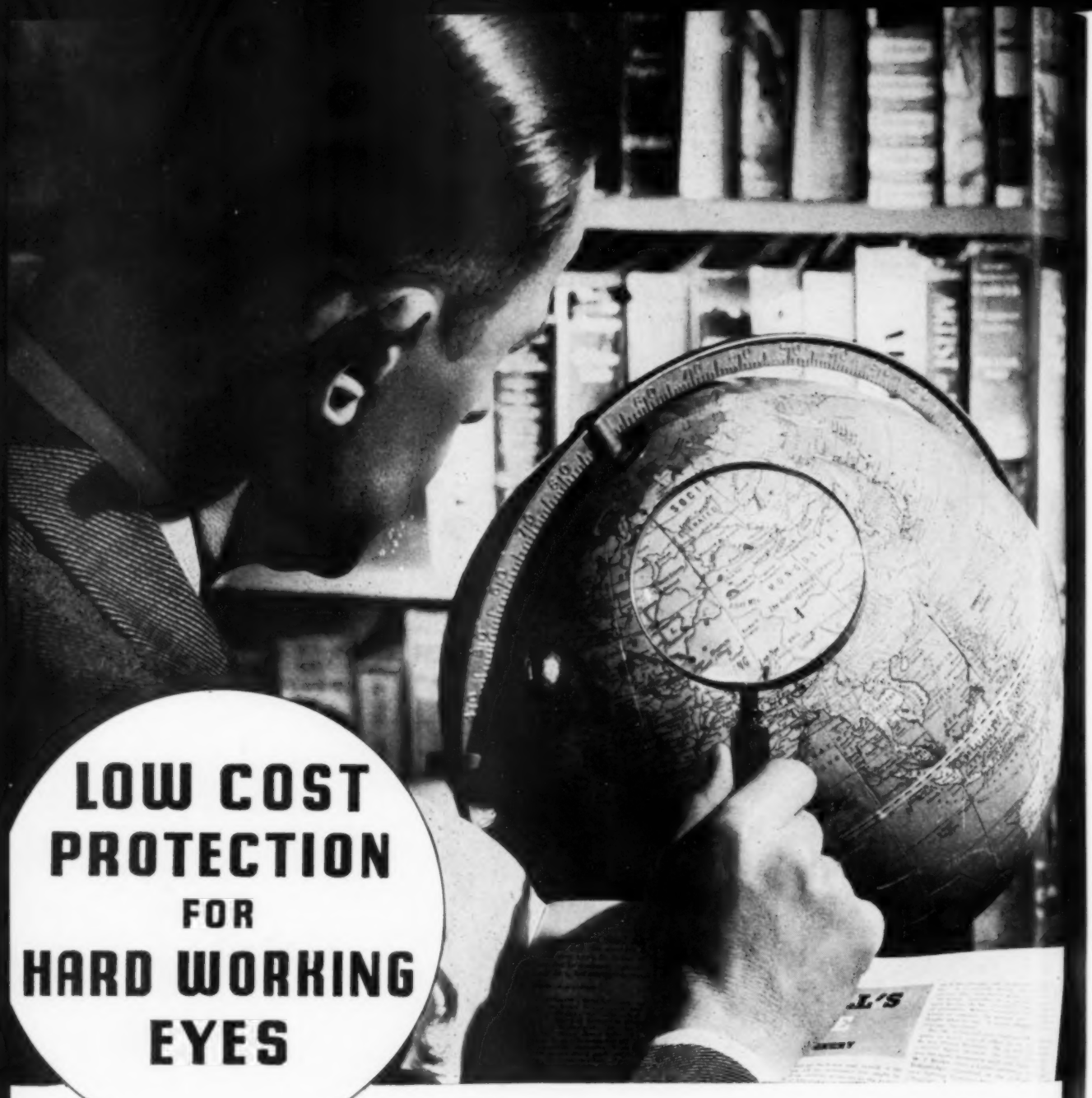

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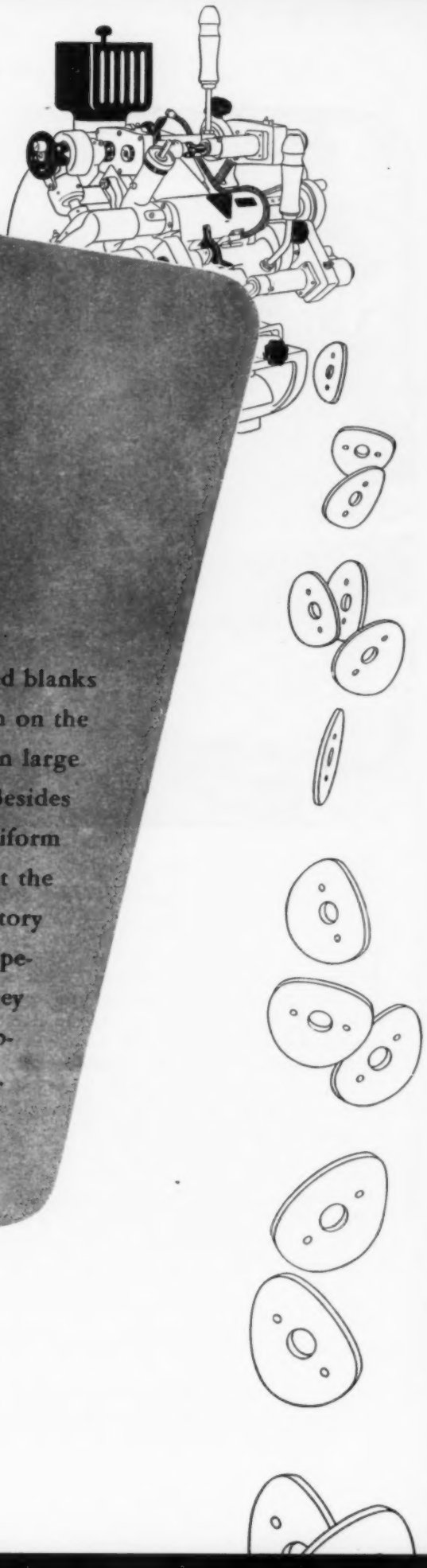

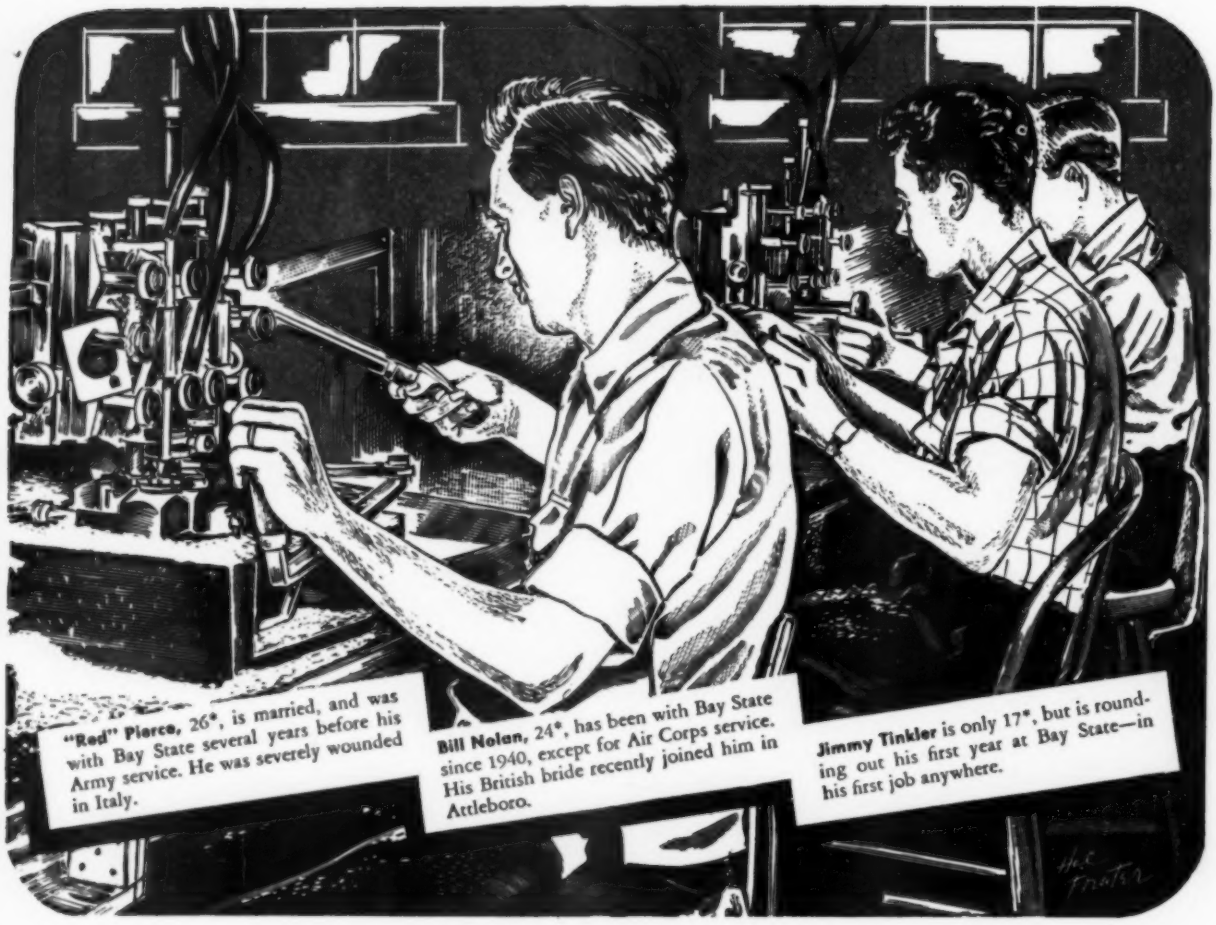
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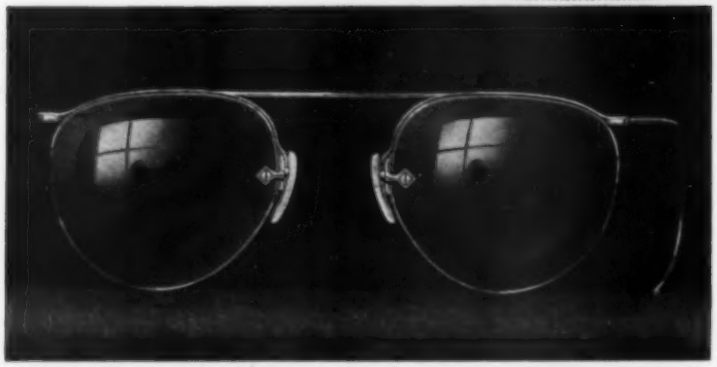

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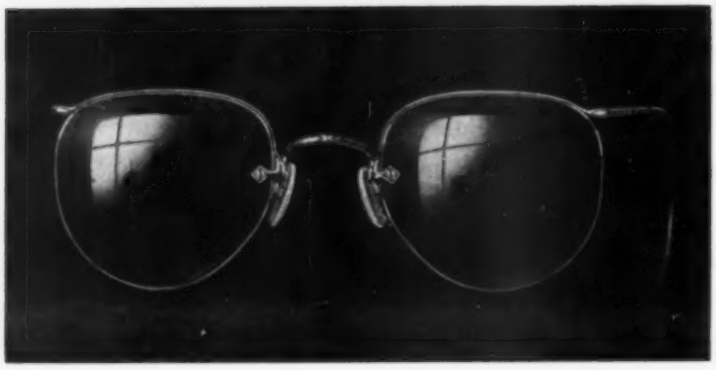

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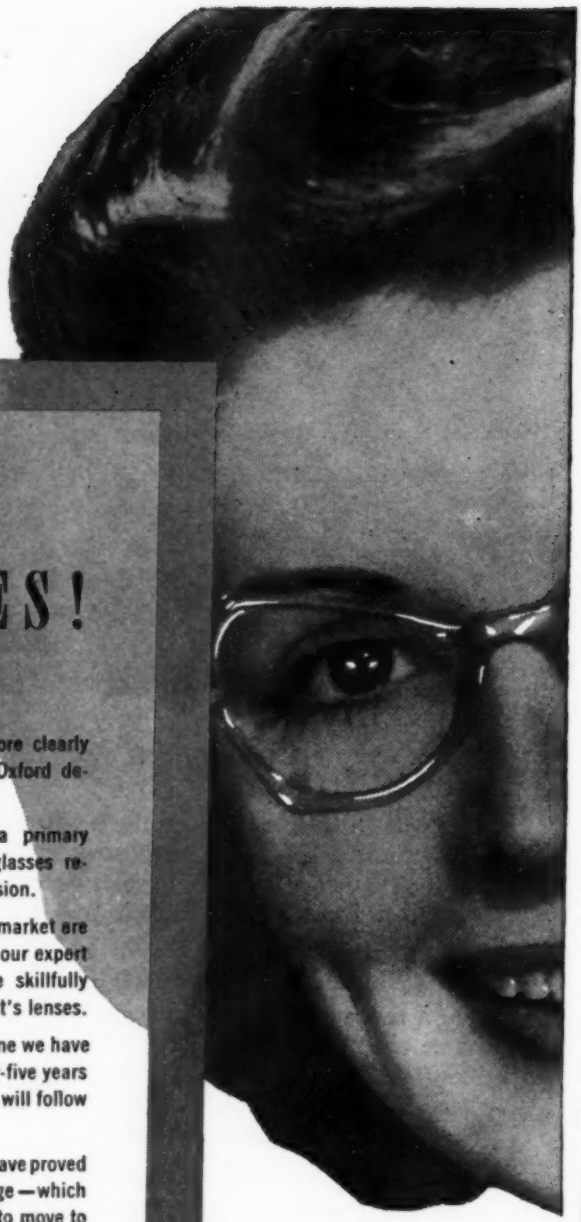

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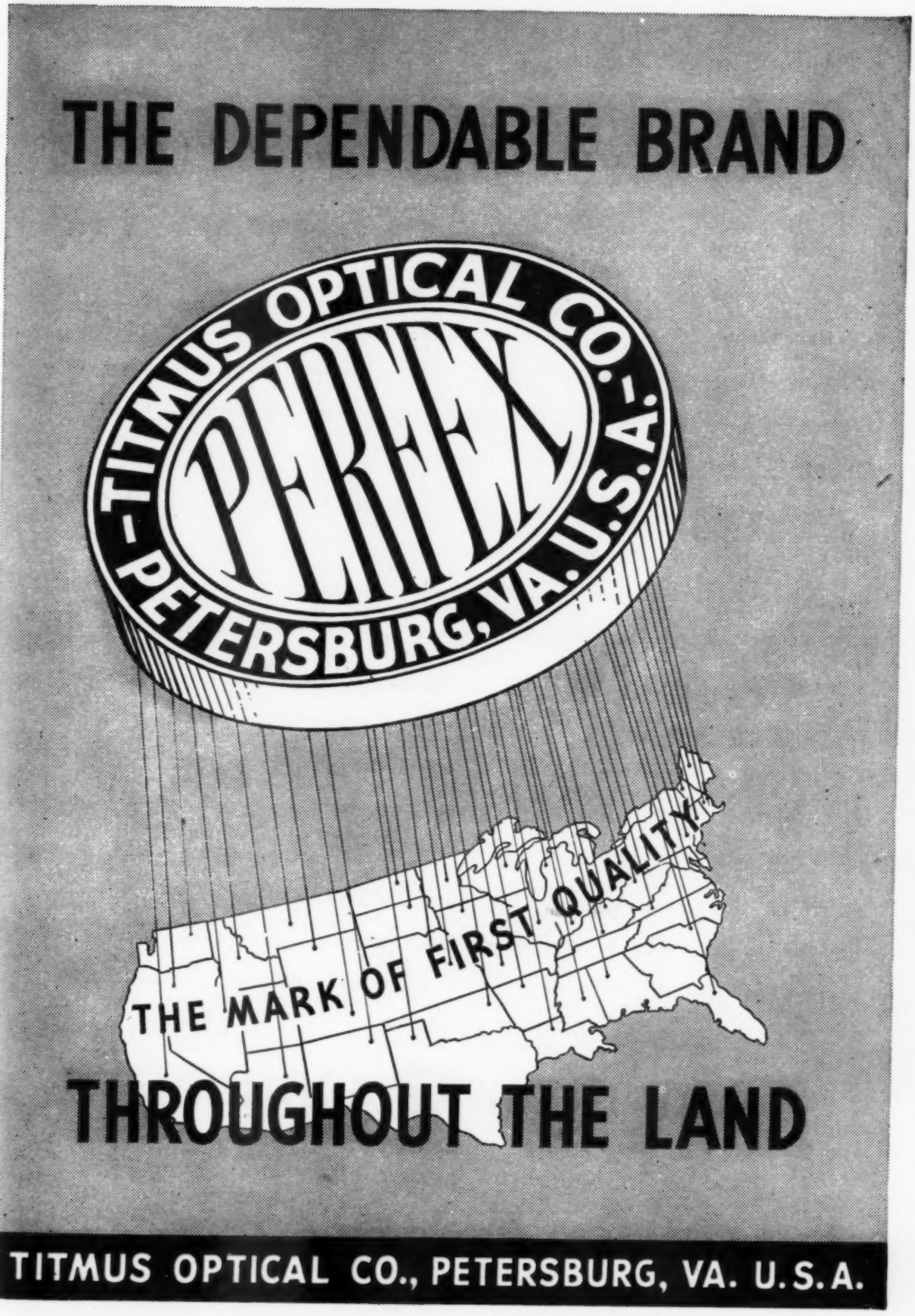
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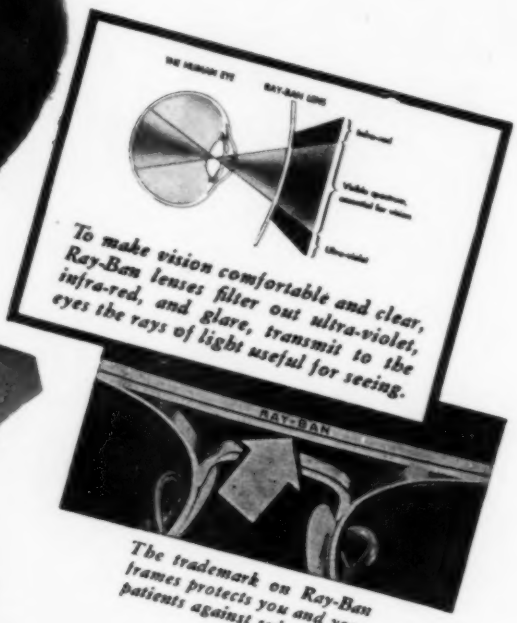
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EXPERIMENTAL INVESTIGATION OF CYCLOFUSION*

V. J. Ellerbrock, M.Sc.†
Hanover, New Hampshire

INTRODUCTION

Numerous investigators in the past have used their talents in the study of cyclofusion. Because their contributions have not been free from controversy, a confused notion about this ocular movement has resulted. A brief historical survey may prove to be of interest.

Nagel[1] was the first to point out that a cyclofusional movement of the eyes could be induced by a rotation of horizontal and vertical lines. He recognized the fact that stereoscopic vision can take place in the vertical meridian of the eyes and not in the horizontal. Because of this, he recommended using only horizontal contours to elicit cyclofusion. These contours might consist of a single horizontal line rotated in opposite directions in a stereoscope, a group of horizontal lines, or even identical prints.

Helmholtz[2] verified Nagel's findings using a Dove prism arrangement. Hering,[3] while not denying the possibility of cyclofusional movements, failed to demonstrate them to his own satisfaction. In 1895 Perry[4] and in 1897 Stevens[5] described methods for measuring cyclofusional amplitudes using a stereoscopic device.

Verhoeff[6] concluded from the results of a study of cyclofusion with a mirror phorometer that the eyes have little or no torsional power, and that the cyclofusional amplitudes can be explained on the basis of Panum's areas. He maintained this point of view as late as 1934.

Hofmann and Bielschowsky,[7] confirmed the findings of Nagel, Helmholtz, and Stevens, using a mirror haploscope. They substantiated

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*Read before the Twenty-second Annual Meeting of the American Academy of Optometry, on December 11, 1945, at Columbus, Ohio. For publication in the August, 1946, issue of the AMERICAN JOURNAL OF OPTOMETRY AND ARCHIVES OF AMERICAN ACADEMY OF OPTOMETRY.

†Optometrist. Division of Research, Dartmouth Eye Institute. Fellow of American Academy of Optometry.

beyond doubt the existence of cyclofusion as a movement. Furthermore, they demonstrated more accurately than any of their predecessors the after effects of single and repeated cyclofusional movements.

In 1926 Ames[8] presented quantitative data confirming the fact which Nagel had first pointed out, that the eyes do not rotate to the extent that vertical diameters can be rotated while fused. A modified Brewster stereoscope was used for these measurements.

Verhoeff[9] in 1934, with apparatus very similar to that used by Hofmann and Bielschowsky, substantiated the latters' findings thereby refuting his own previous claims.

Objective measurements by means of a telescope of the cyclotorsional positions of the eye in cyclofusion tests with a haploscope were made by Brecher[10] in 1934. Beasley and Peckham[11] in 1936 using a similar technique claimed that no torsion could be observed.

Certain essential facts concerning cyclofusional movements have been secured from these investigations. (1) Cyclofusional movements do take place and can only be induced by adequate stimuli. (2) Since cyclofusional movements are neither voluntary nor involuntary and depend on the attention of the observer, they can be called psycho-optic reflexes. (3) Akin to other fusional movements cyclofusional movements increase gradually, reaching a maximum only after a series of repetitive tests. Furthermore, the fusion innervation does not disappear immediately upon cessation of the stimuli inducing the movement. It decreases slowly, and a residue of decreasing size can be measured for some time after the test. (4) One of the most important facts concerning the nature of cyclofusion is that it cannot be equally induced in all meridians. It is this factor which has been the source of most of the difficulties encountered by investigators studying cyclofusion.

In this paper an entirely different method for the measurement of cyclofusion from those used in the past will be described, as well as some of the results which have been secured with it.

METHOD

In order to induce a cyclofusional movement, it is necessary to twist or rotate similar images in the two eyes in opposite directions.* This can be accomplished in a number of different ways. The traditional technique was to rotate the test object on the two halves of a stereogram. The angular difference of the two stimuli produces the cyclofusional

*Cyclofusional movements can likewise be induced by a rotation of the test objects in the same direction. A comprehensive study of this movement has been made by Noji.[12] He considers the parallel cyclofusional movements to have the same nature as the contrary cyclofusional movements.

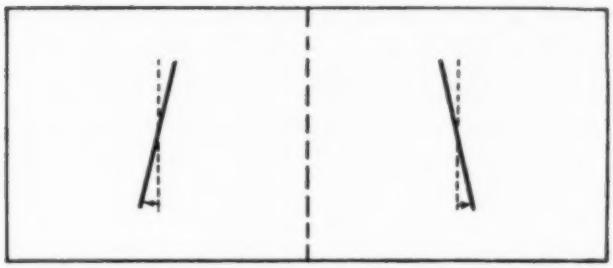


Fig. 1—Illustration of one of the many different types of stereograms which have been used to study cyclofusional movements.

stimulus (Fig. 1). If a reflecting stereoscope is used, it is usually much easier to rotate the test object (Fig. 2). Both of these techniques have the advantage over the Maddox rod method simply because the test stimuli can be varied.

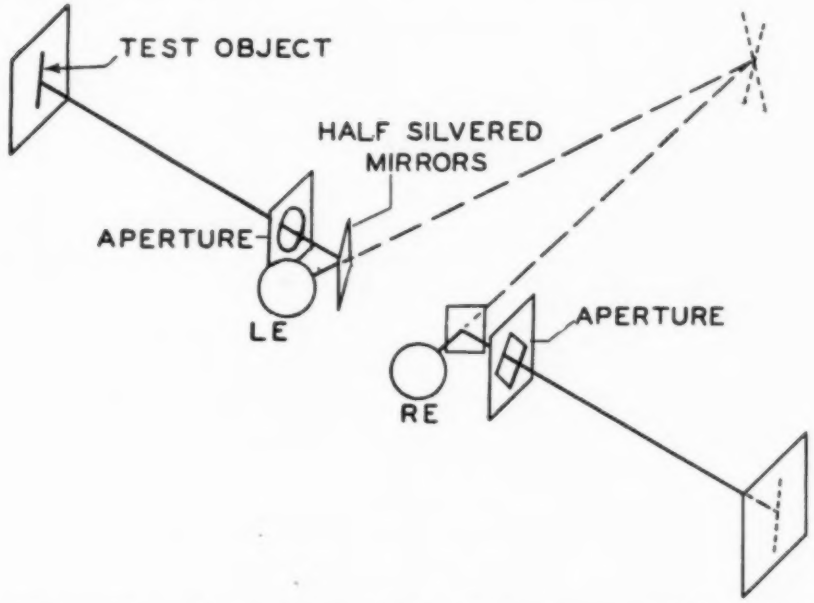


Fig. 2—The optical arrangement of the reflecting stereoscope used to induce and study cyclofusional movements.

The criterion of whether or not a cyclofusional movement is made by the eyes in each of these three techniques is whether or not the test object is seen single after the images in the two eyes have been rotated in opposite directions. For predominantly vertical contours with such a criterion, it is impossible to know to what extent the total declination of the images has induced a cyclofusional movement. The reason is, that

a rotation of the vertical contours produces a lateral disparity of the images on the retina which might be within Panum's areas and consequently could be fused by stereopsis. This condition is illustrated in Figure 3.

Fig. 3A

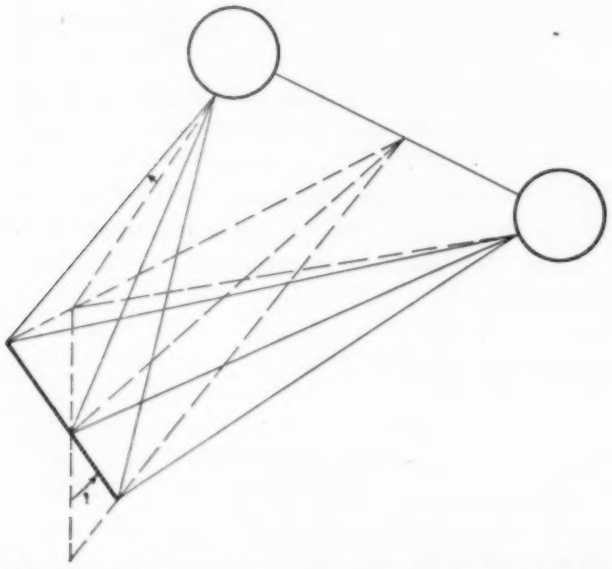
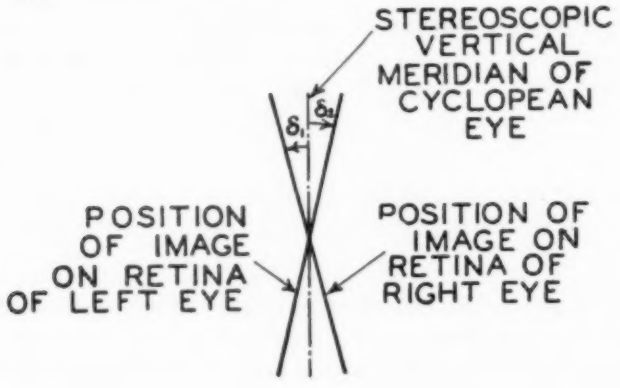


Fig. 3—Schematic illustration of the position at which the stereoscopically fused image of declinated vertical lines is seen in space when the torsional position of the eyes remains fixed.


STEREOSCOPIC VERTICAL MERIDIAN OF CYCLOPEAN EYE
δ_1
δ_2
POSITION OF IMAGE ON RETINA OF LEFT EYE
POSITION OF IMAGE ON RETINA OF RIGHT EYE

B

Fig 3B.

If the images presented to the two eyes fall on the retina as illustrated in 3A, and if these images are fused stereoscopically, the object will appear rotated in space about a horizontal axis as shown in B. From analytic geometry the inclination i, of this line is found to be:

$$(1) \quad \tan i = \tfrac{1}{2} \frac{b}{a} \tan (\delta_1 - \delta_2) \quad \text{(approx.)}$$

where b is the fixation distance, a is ½ the interpupillary distance, and (δ_1 and δ_2) represent the declinations of the images on the retinas from the stereoscopic vertical meridians.[13]

The possibility exists that a different criterion might be used for a test object with vertical than for horizontal contours. For example,

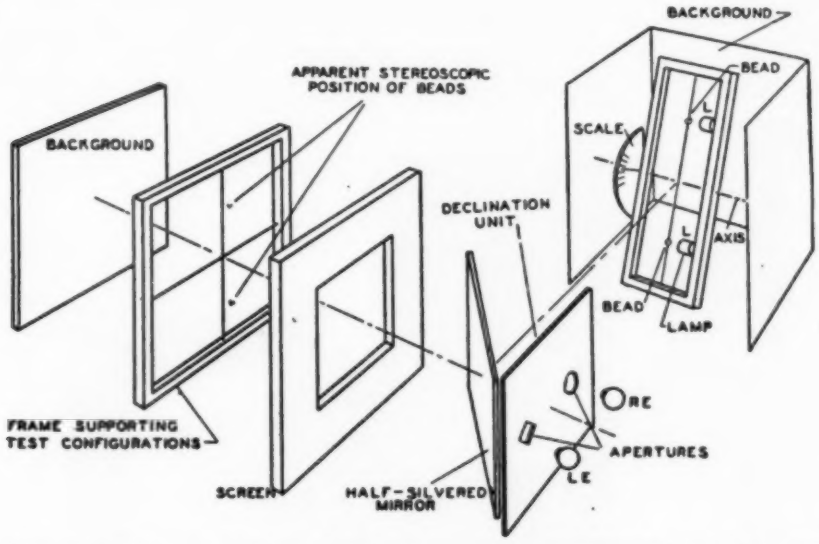


Fig. 4—Perspective drawing showing the essential mechanical details of the instrument which was developed so that the apparent stereoscopic vertical could be measured.

when a test object of a vertical line appears to incline fore and aft in space, one would know that the eyes have failed to respond to the disparity by a cyclofusional movement and that stereopsis has taken place. Such a criterion presupposes, however, that the eyes will respond to the disparity initially by a cyclofusional movement and then by stereopsis. This supposition cannot be experimentally substantiated.

The limitations of the various techniques used to investigate cyclofusional movement described above necessitated that a totally different method be employed. The instrument which was developed to over-

come these limitations is illustrated in Figure 4. The test elements were mounted on a frame which was firmly fixed 2 M distant from the subject's eyes. The frame was 42 inches square with its center 50 inches from the floor and could be rotated about a horizontal axis. The square aperture between the subject and the test elements was of such a size that it limited the field of view to the test elements only. The latter were illuminated by two lumiline lamps mounted on either side of the screen containing the large limiting aperture. The background against which the cords were seen was a single large piece of black velvet cloth stretched tightly on a wooden frame. The room was in total darkness except for the stray light from the lamps illuminating the test elements. Dissimilar apertures directly in front of the subject's eyes prevented peripheral fusion. For the experiments which will be described, a bite was used, though this is not an absolute necessity.

With this arrangement of the instrument it is possible to rotate the images of a vertical line on the retinas by rotating the test element

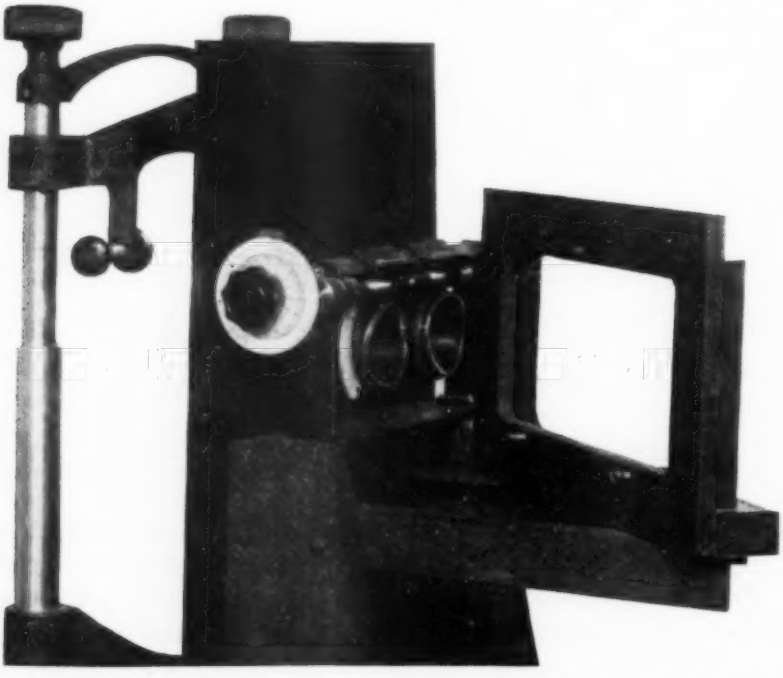


Fig. 5—Photograph of the geared meridional magnifying lenses used to introduce declinations of the images of the test elements.

frame about a horizontal axis. The total rotation of the two images is given by:

$$(2) \quad \tan \delta_t = \frac{2a}{b} \tan i \quad \text{(approx.)}$$

where a, b, i and δ_t have the same designation as in equation (1). Thus large values of i produce relatively small values of δ. Table I gives the relationship between these two angles for a fixation distance of 2 M. and an interpupillary distance of 64 mm.

Although it is possible to produce a rotation of a vertical test object with this technique, it cannot be done in like manner for a horizontal one. Likewise, monocular factors of depth localization such as changes of brightness and an appreciable difference in size of the test elements, as well as the limited rotation of the test frame behind the large limiting aperture, prevent a general application of the technique. For these reasons, matched meridional magnifying lenses 44mm. in diameter, which were geared together so as to rotate in opposite directions, were mounted directly in front of the dissimilar apertures (Fig. 5). The mechanical mount of the lenses was so designed that the centers of the lenses corresponded to an average interpupillary distance of 64 mm.

i°	δ°	i°	δ°
0	0.00	30	0.94
10	0.20	40	1.40
20	0.60	50	1.90

TABLE 1

The declination of the images on the retinas for each 10° inclination of a vertical test element are given for a fixation distance of 2M, and an interpupillary distance of 64 mm.

A meridional magnification lens introduces a rotary deviation of the images of all lines in space not parallel or perpendicular to the axes of the lens (Fig. 6). All lines are deviated toward the meridian of magnification, and for the vertical and horizontal lines the deviations are opposite but substantially equal. The relationship between the rotation of the images δ, the magnification, and the setting of the lenses is given with sufficient accuracy by the formula:

$$(3) \quad \delta = 0.29 \text{ m} \sin 2\phi^{13}$$

Angle ϕ is to be considered O when the axes of the meridional lenses

are parallel and vertical. Table 2 lists the values of δ_i for each five degree setting of the 2% paired meridional lenses which were used for this experiment. The lenses were rotated by means of a worm gear and could be accurately set to $\pm$ 0.5° ϕ, or $\pm$ 0.02°δ.

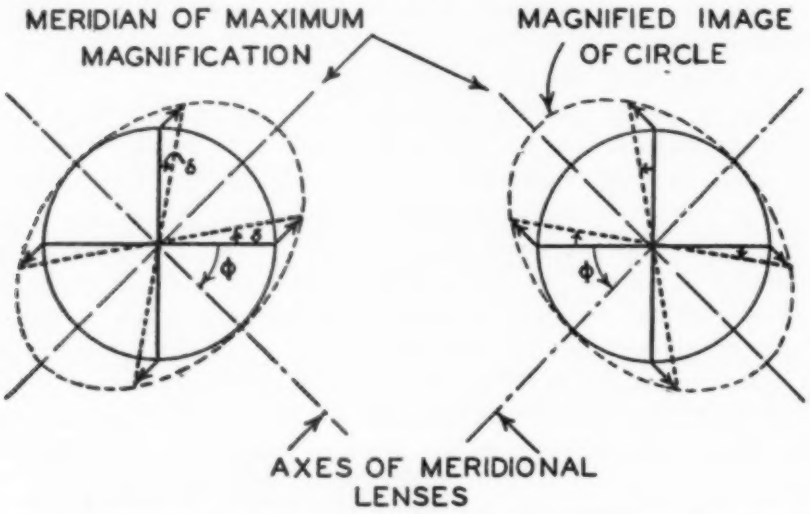


Fig. 6—Illustration of the declination errors (δ) introduced on the images of the vertical and horizontal lines for a meridional magnification at an oblique meridian ϕ.

ϕ°	δ°	ϕ°	δ°
5	0.10	30	0.58
10	0.20	35	0.66
15	0.30	40	0.74
20	0.39	45	1.16
25	0.49		

TABLE 2

The sum of the declinations of the two images are listed for each 5° setting of the paired meridional lenses.

The value of rotating an element seen in space against an almost totally black background hardly need be emphasized. Even with the haploscope it was extremely difficult to eliminate the monocular clues which gave knowledge of the position in space of the cord or film on which the elements were printed. In this experiment the test elements were cords of varying size and color which were seen against an unlocal-

ized background. The slightest change in declination between the images of a vertical element would result in an altered position of the element in space if the declination were not immediately corrected by a cyclofusional movement.

As was pointed out earlier in this paper, the principal limitation of the haploscope and maddox rod methods of studying cyclofusion, is that the cyclofusional movement in response to a given declination of the images cannot be measured. For this reason, it was necessary to employ a technique to measure the torsional position of the eyes. This was done by employing a means by which the amount of rotation of a test element from the subjective vertical could be determined. In order to accomplish this, test elements which were weak fusional stimuli, were mounted on a second frame, which could be rotated about a horizontal axis. For convenience this second frame was mounted at right angles to the median sagittal plane of the subject's head and by use of a half silvered mirror appeared to be at the same distance as the frame to which the test elements were mounted (Fig. 4). Stretched from the top to the bottom of the frame was a fine black thread on which were threaded two small pearl beads (diameter, 3 mm.). These were illuminated by parallel rays of light from the light houses mounted on the frame and could be intermittently illuminated for various "on-off" phases. An appropriate scale mounted on the frame permitted its position to be accurately read to the nearest 0.5°. The room in which the experiments were performed, as well as the frame and its attachment to the wall, were painted a flat black. Only the illuminated beads could be seen by reflection from the semisilvered mirror mounted directly in front of the geared meridional lenses. The position of the frame could be changed by the subject with the use of cords and handknob.

RESULTS

The use of the beads to determine to what extent the eyes have rotated by cyclofusion to a given stimulus configuration permits a very exact measurement to be made of the relative position of the eyes to each other. For example, consider the results secured when a declination of the images of a vertical white string was introduced by means of the geared lenses (Fig. 7).* On the abscissa are plotted the values of delta

*The results of two subjects with the different test configurations are illustrated. Both subjects had refractive and astigmatic errors of less than 0.25 diopter, and negligible phorias at 6 meters. The visual acuity of each eye of each subject was 20/15 or better.

introduced by the lenses, and on the ordinate are plotted the computed values of the deltas for the inclination of the beads when the latter were set so that they appeared to lie in the subjective vertical plane.*† If the eyes had responded to the declination by a cyclofusional movement the

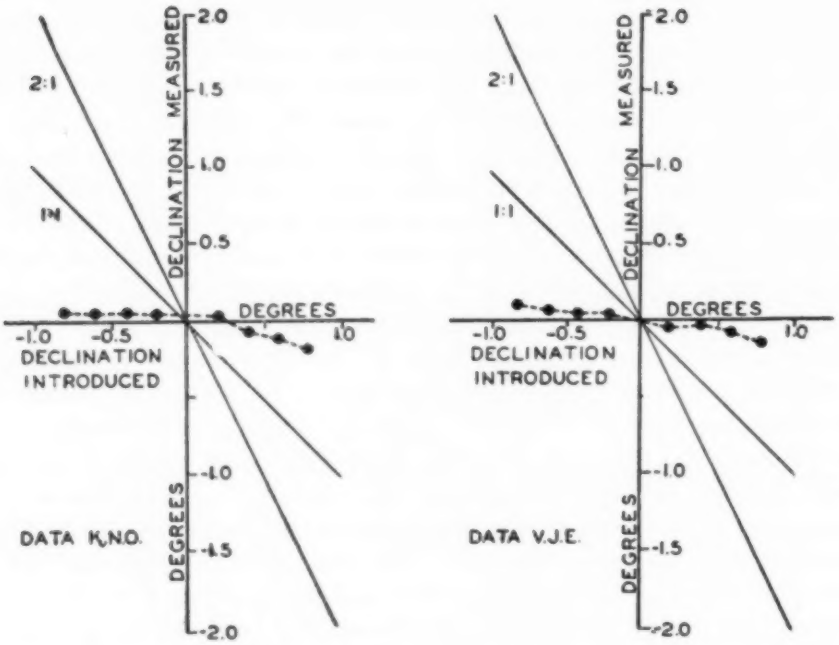


Fig. 7—Typical data secured when the test element was a single vertical cord and the declination was introduced by means of paired meridional magnifying lenses. The beads were intermittently illuminated at a rate of one second on, one second off.

beads as well as the test cord would have appeared vertical and the measured deltas would have been zero. If the eyes had not responded to the declination of the images by a cyclofusional movement the cord as well as the beads would have appeared equally rotated in space. The measured deltas by means of the beads would then have equalled the deltas introduced by the geared lenses and the plotted points would have fallen on the line marked 1:1. That the eyes responded to the declination of the images by a cyclofusional movement almost equal to the

*†The standard deviation of the computed declinations of the images (δi) of a series of settings of the beads for any configuration would rarely be found to be larger than 0.1°.

declination can be seen from a study of Figure 7.† Increasing the length of observation did not alter this relationship.‡

When a horizontal cord instead of the vertical was used, results similar to Figure 8 were secured. In order to understand this, it is necessary to recall that the declination lenses produce an equal and opposite disparity on the images of vertical and horizontal elements. Both images are rotated in the direction of the meridian of maximum

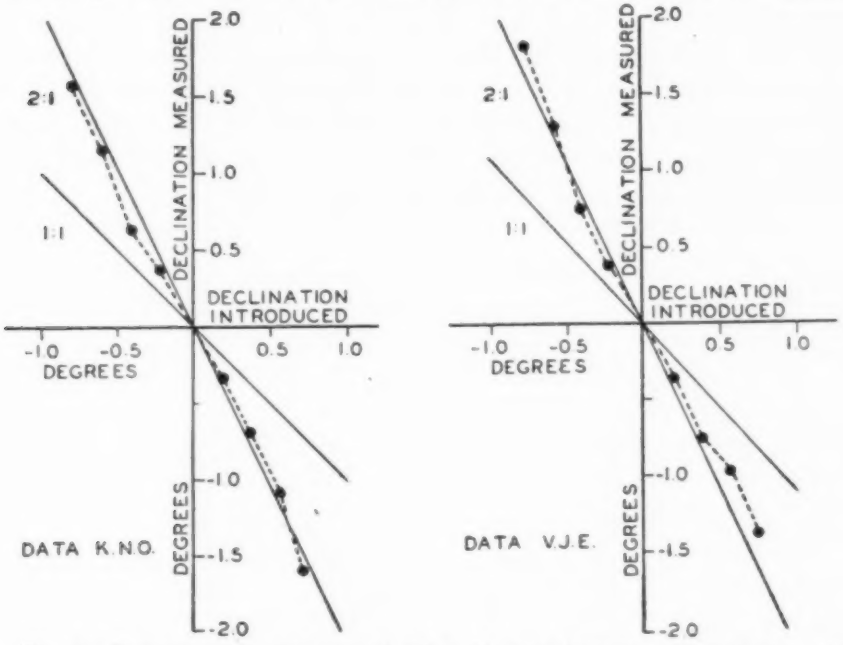


Fig. 8—Representative data secured when the test elements consisted of a single horizontal cord. The beads were intermittently illuminated at a rate of one second on, one second off.

magnification of the lenses. In this case, if the eyes responded to the images of the horizontal string by a cyclofusional movement, twice the delta introduced by the declination lenses would be present on the images of the beads. The measured delta would then be double that which would be found had the eyes made no cyclofusional movement.

†When the axes of the meridional lenses were rotated so that they converged up, or above the lenses, the declination introduced before the eyes was designated plus, and when converging down or below the lenses, minus. The inclination of the beads was designated plus when the frame supporting them was rotated so that the top bead was farther from the subject than the bottom one.

‡A shutter which occluded all but a very small central portion of the visual field for the right eye was used between judgments and while the position of the geared lenses was changed.

Figure 8 illustrates that the eyes can and do perform cyclofusional movements in response to declinatory images located in the horizontal meridian of the eyes. These results, likewise, show that the cyclofusion is complete or total. If the eyes had failed to respond to the declination of the images of the horizontal cord by a cyclofusional movement but had responded to the disparity on the images of the beads, the slope of the curve of the results would have been somewhat between that found and zero.

The results, secured by the use of both the horizontal and vertical cords, were obtained only because the cyclofusional stimuli of the disparate images of the beads were very weak. They were so weak in comparison to the rotated images of the cords, that the influence of the beads was negligible and was not apparent in the results.

When both vertical and horizontal cords are used in the same

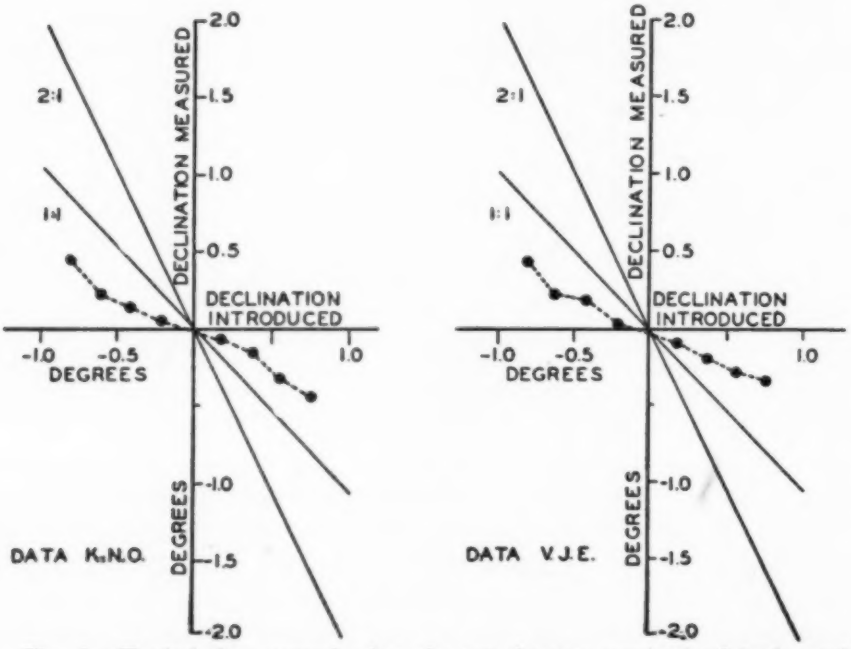


Fig. 9—Typical data secured when the test elements consisted of both vertical and horizontal cords. Equal and opposite declinations were simultaneously introduced on the vertical relative to the horizontal by means of the meridional magnifying lenses. The beads were intermittently illuminated at a rate of one second on, one second off.

stimulus pattern and the declinations are again introduced by the meridional lenses, the relative strength of the horizontal stimulus to induce a cyclofusional movement in comparison with the vertical can

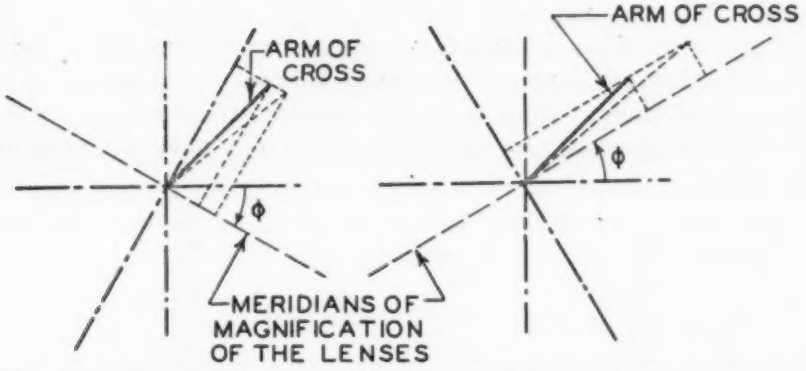


Fig. 10—Schematic illustration of the equal displacement of the corresponding arms of a cross by means of meridional magnifying lenses rotated in opposite directions. Because the displacement is equal and in the same direction no lateral disparity is introduced and consequently spatial position of the cross is not altered by the lenses.

be investigated. If the slope of the curve which best fits the data is less than 1, then the cyclofusional stimulus of the declinated images in the vertical meridian is stronger than in the horizontal. Figure 9 illustrates that this is actually what is found.* The reason the slope of the line which best fits the data with this configuration is greater than with the single vertical cord, apparently is due to the antagonistic stimuli to cyclofusional movements of the images of the horizontal cord. If this explanation is correct, the use of a configuration of vertical and horizontal test elements by which cyclofusional movements can be induced equally in either direction, or the use of a configuration whose images are not influenced by the magnification lenses, should make the slope of the line of best fit to the data points to be further increased.

Two cords at right angles to each other and orientated so as to lie at 45 and 135° to the subject and directly in front, are not spatially influenced by the paired meridional lenses. This is because the image of an arm of the cross is deviated as far in one direction in one eye as the image of the corresponding arm of the cross is deviated in the other eye (Fig. 10). Consequently, no matter where the lenses are set when no other elements are present, the cross will appear to lie in the subjective vertical plane of the subject.

When only the cross and beads are used, and the declination is introduced by the geared lenses, results similar to Figure 11 are secured.

*The possibility exists that the declination introduced by the images of the beads, which are in the vertical meridian, might be a strong enough stimulus to cyclofusion that it could account for these results. This has not been experimentally investigated.

The fact that the data falls exactly on the line marked 1:1 indicates that the cross has entirely prevented any cyclo-rotation of the eyes to fuse the disparate images of the beads. When a configuration of only vertical and horizontal cords is used, a balanced weighting of the horizontal to vertical cords can be found which will have the same effect as the cross.

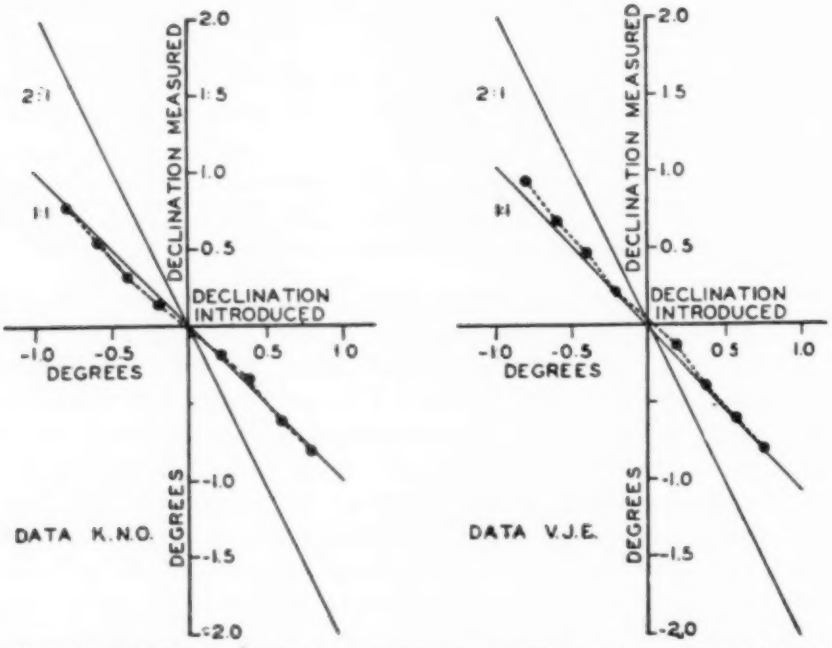


Fig. 11—Data secured with test elements consisting of two cords which were perpendicular to each other to form a cross and orientated so as to lie at 45 and 135°. These results show that the eyes did not rotate and that the fusion on the disparate images of the beads was only by stereoscopic fusion. The beads were intermittently illuminated at a rate of one second on, one second off.

CONCLUSION

A method has been described by which the torsional position of the eyes can be accurately measured. The method consists in the use of test elements which can be rotated in space, geared meridional lenses to produce the declination of the images, and small points of light which can be rotated independently of the test elements, by which the position of the latter from the subjective vertical can be determined.

One of the most fundamental facts brought out by the results presented is that the eyes respond to the declination of the images of vertical test objects by a cyclofusional movement. Perhaps of equal

importance is the finding that although these images are very quickly fused by non-corresponding points on the retinas the neural mechanism is such that the eyes are induced to a torsional position and the rotated images are fused by corresponding or almost corresponding points.

The fact that the eyes entirely overcome the declination of the images of a horizontal element when it is isolated in the test pattern indicates that the stereoscopic mechanism in the vertical meridian causes a looseness or flexibility in the rotary movements of the eyes. The similarity of the cyclofusional movements in the two meridians should be carefully noted.

Although no conclusive proof is presented in this paper that the cyclofusional properties of the eye in the vertical meridian are stronger than in the horizontal, nevertheless the results of Figure 8, are at least suggestive of that fact. Further proof of this point is presented in another paper now at press.[14]

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PRODUCTIVE INDUSTRIAL VISUAL EFFICIENCY*

Emerson J. Soland†

Indianapolis, Indiana

During recent years, industries both large and small have come to realize that eyes are one of the most vital instruments for the safety of workmen and increased production.

Since the inception of visual efficiency programs in these industries, great progress has been made, and more and greater improvements are being discovered. With each new development, visual efficiency and protection are being increased not only for the benefit of the employer but also for the employee.

In order that we may see more clearly the progress that has been accomplished, let us briefly summarize the steps that have been taken for the improvement of eyesight in industries.

PROTECTIVE EYE WEAR

Hardened Plano lenses in industrial frames, goggles, face shields, and plastic lenses were some of the first types of industrial eye wear adapted by the optical manufacturers and accepted by the industries. These items, for protection only, have been and should continue to be commodities sold directly to the industries by the optical manufacturer.

The decisions of quality, the fitting for safety and comfort, and the effects upon the wearer's eyes are the direct responsibility of the professional eye-man. This fact can be borne out by the graph in Figure 1 representing one industry of approximately 1600 employees doing precision work.

From March, 1943, to February, 1944, the only consideration given to eyesight in this plant was a Snellen test at twenty feet, and hardened Plano safety lenses to reduce loss of vision or its impairment through foreign bodies, flashes, splashes and similar ocular accidents. Protective equipment was issued upon the requisite of the foreman, and furnished through the supply department as a tool along with other materials necessary for performing a specific job.

From March, 1944, to January, 1945, the program pertaining to

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†Optometrist. Fellow of American Academy of Optometry.

eyesight was augmented by obtaining a definite screening device for the purpose of not only determining the employee's distant acuity readings (which were of no value other than for Medico-legal data) but also the employee's visual efficiency at both distance and near. Through this improved program many employees were encouraged and willing to wear protective glasses, as these glasses were ground to their exact prescription determined by the examining doctor for the correction of their

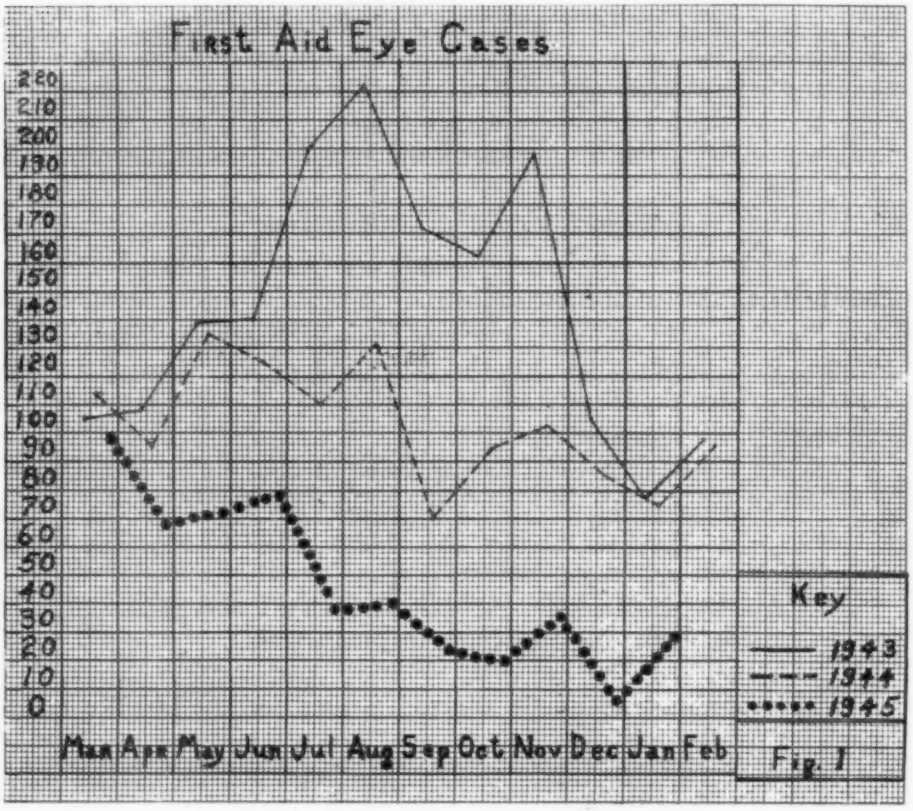

Fig. 1

visual defects. During this period the fitting and selection of the ophthalmic materials were taken care of by members of the safety department, who were unfamiliar with the optical principals of lenses and the proper frame selections and adjustments for the best comfort, safety and visual efficiency of the wearer.

The members of management and safety departments, appreciating the great progress made in reducing eye injuries and observing the

increase in the quantity and quality of production, felt that still further improvements could be made by placing the supervision of the eyes of its employees into the hands of professional eye-men who through studies and application have a thorough knowledge of the physiology of the eye and experience in industrial vision.

In January, 1945, the services of a professional eye-man were obtained to act as supervisor and consultant on all problems in the plant pertaining to the visual safety and efficiency of its employees.

The graph readily reveals that this progressive step has returned dividends in safety for the employees and has saved them much lost time and many hours of suffering and distress.

It may further be observed that from January, 1945, to the time of this writing no lost time eye accidents have occurred at this industrial institution.

SCREENING INSTRUMENTS

The first screening used by industry was the Snellen chart at twenty feet.. All of us, the industrialists and the professional people, have long realized that such a test is of little value save for Medico-legal records. It is merely a test for the protection of the industry and the insurance companies in determining the legality of claims made by the employee.

When the Snellen test failed to assist in obtaining and maintaining the best visual efficiency among the employees, several optical manufacturers, after years of research and study, produced visual screening instruments which can be used to:

1. Accurately and quickly check the visual fitness of an employee on his present job or for applicants in preplacement.
2. Obtain data for use in determining compensation claims.
3. Determine and obtain occupation data for the visually handicapped.

Each of these instruments have their limitations which brings us to our final step so far obtained.

PROFESSIONAL SERVICES

To date these screening devices have been placed in the hands of lay personnel or under supervision of medical departments of industry.

Let us not be hasty in our condemning such procedures, for they have accomplished tremendous progress in better visual efficiency and job placement. However, the writer, after working directly with these instruments, has developed the conviction that the greatest limitation

of these programs is the lack of professional consultation and supervision of the entire program pertaining to the eyesight safety and efficiency of the employees.

VISUAL JOB ANALYSIS

Date: .....

Department No.: ..... Job No.: .....

Name of Department: .....

Job Description.....

.....

VISUAL REQUIREMENTS

General Working Distance: .....

Critical Working Distance: .....

Multiple Work Distance: .....

Near Acuity: E.....S.....C..... Distance Acuity: E.....S.....C.....

Near Muscle Balance: E.....S.....C..... Distance Muscle Balance: E.....S.....C.....

Stereopsis: E.....S.....C..... Color Vision: E.....S.....C.....

Bifocals: Yes.....No..... Type: .....

Trifocals: ..... Double Seg: .....

Tint in Lenses: Yes.....No..... Shade: .....

Hazards:

Glare..... Foreign Bodies..... Flash..... Dust..... Fumes..... Splash .....

Protective Eye Wear: .....

Work in Motion: ..... Work Stationary: .....

Visual Retest: .....

Remarks and Recommendations: Lighting Recommendations:

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Signed:

Dr. .....

FIGURE 2

To bear out these convictions, let us look at the services to be rendered by the professional man and those in industry who are to assist him to give and maintain highest visual efficiency at all times.

1. *Visual Job Analysis*

The purpose of a job analysis is two-fold. The first is to provide for the professional man firsthand information regarding the exact working conditions of the specific operation that is being performed. The other is to physiologically record the visual requirements for the best visual performance at each particular operation, under the present working conditions. This analysis can be completed only by a professional man experienced in the problems of industry. He is to be accompanied in this work by some one in the industry who is entirely familiar with each and every operation such as the foreman in each department.

Explanation of Form in Figure 2

a. Department No.—as taken from payroll department.
b. Job Title No.—as taken from payroll department.
c. Name of Department—taken from foreman.
d. Job Description—a very brief outline of the particular operation, type of machinery or tools used, and the objective of the job.
e. General Working Distance—Area around which employee must actually see to perform job duties. This must be measured from the eye to the farthest visual point.
f. Critical Working Distance—Concentrated work area, over a greater part of their working hours. This must be measured from the eye to the nearest point of seeing.
g. Multiple Work Distance—This must be considered, and measured if exacting acuity is required at any point between general and critical working distances.
h. Near Acuity
i. Distance Acuity
j. Near Muscle Balance
k. Distance Muscle balance
l. Stereopsis
m. Color Vision

These catagories are in code and can only be interpreted dependent upon the screening methods used by the particular industry.

Briefly: "E" is preferred.
"S" is permissible.
"C" is to be referred for a complete visual analysis by

a professional man. These requirements are for either or both eyes.

n. Bifocals:

Due to the unusual tasks required in some occupations, bifocals can be successfully used in some but not in other occupations.

o. Type:

When bifocals are satisfactory for the job, it is also necessary that special types of segments be used for greatest comfort and efficiency of the employees.

p. Trifocals:

Trifocals are unusually practical for some occupations and should be prescribed whenever recommended and advisable.

q. Double Segments:

Double segments in lenses can be most helpful to the successful operation of some jobs but should be used only as an occupational prescription..

r. Tint in Lenses:

This recommendation is given from the observance of the occupation only, and can be altered by the refracting doctor, dependent upon the employee's visual condition.

s. Shade:

The shade for the particular occupation can only be determined through a job analysis, taking into consideration the light recordings and the work surfaces.

t. Hazards:

Glare, foreign bodies, flash, dust, fumes, splash, lint, etc.

u. Protective Eye Wear:

Whenever any of the above hazards are present, the employees are to be provided with, and wear, the proper protective, occupational eye-wear as recommended by the supervising professional man. It is recommended that all protective eye-wear be used in metal frames for comfort and proper adjustments.

v. Work in Motion:

w. Work Stationary:

x. Visual Retest:

Length of time intervening between visual efficiency tests.

y. Remarks and Recommendations:

Recommendations are from a physiological and clinical

standpoint.

z. Recommendations:

Recommendations are from a physiological viewpoint and from the effects of the lighting upon the individual worker with relation to his work. The improvement and corrections of these lighting conditions can best be accomplished by obtaining the services of an illuminating engineer, who would work in co-operation with the company's engineers, and the consulting professional eye-man.

The following results have been found in grouping all occupations under particular headings. (One industry having 1,657 employees.)

I

1. Thirty-three occupations require good visual efficiency inside of 13 (thirteen inches.)
2. Sixty-five occupations can be performed with the operators wearing bifocals of one type or another.
3. Twenty-seven occupations can be performed with the use of trifocals.
4. Thirty-four occupations can best be performed by the operators wearing special occupational lenses for the job.
5. Thirteen occupations require hardened protective eye-wear of which:

   7 can wear bifocals
   3 can wear trifocals
   3 require occupational lenses

6. Five occupations require some type of lenses before the employee's eyes; however, they need not be hardened, protective lenses. Of this group:

   3 can wear bifocals
   2 require occupational lenses

II

Visual Retest Groupings

1. Twenty-two occupations require visual efficiency tests to be made every six months.
2. Seven occupations require visual efficiency tests to be made every nine months.
3. Sixty-six occupations require visual efficiency tests to be made every twelve months.

4. Eighteen occupations require visual efficiency tests to be made every eighteen months.
5. Thirty-one occupations require visual efficiency tests to be made every twenty-four months.

To gain the utmost from this type of visual program, the following procedure should be inaugurated:

1. Make new visual efficiency test of all employees in the plant, beginning with the group requiring test every six months, and proceeding through 9, 12, 18, and 24 until all have been tested.

2. A different colored 3 x 5 card is to be used for each group (6, 9, 12, 18, and 24 months). On this card the employee's name, department, date of test and clock number are to be recorded; the recommendations and date of personal interview, and the date the employee is to report back to the proper authority, if he or she has been advised to seek professional care and service for his or her eyes. (Figure 3.) To

Company's Name:
City and State:

Name: .....
Department: .....
Date of Visual Test: .....
Date of Interview: .....
Date Card Sent to Employee: .....
Findings and Recommendations: .....
.....
.....
Examining Doctor: .....
To Report: .....
Reported: .....
To Receive Visual Retest: .....
Tester: .....
Remarks and Steps Taken for Correction:
.....
.....
.....
.....
.....
.....
.....

FIGURE 3

this card should be attached the report from the optometrist or ophthalmologist showing what has been done, and his recommendation for the

conservation and preservation of the individual's visual efficiency. These cards are to be properly filed for quick referral, whenever the occasion may arise.

3. The testing and handling of this service should be available to as few people as possible and should be kept confidential for the benefit of all concerned. Also by fewer people having access to these records, there will be less possibility of errors and over-sights.

4. After testing, each employee having the required efficiency for a certain occupation should be given a card stating this, also specifying when a retest is to be made. (Figures 4 and 4A.) Each employee failing

Company's Name:
City and State:

Employee: .....
Department: .....
On..... ...., your eyes were tested by our improved methods. At the time of the test, your visual performance was satisfactory for your present job:
.....With glasses on.
.....Without glasses.
For the sake of your safety and health and work, we urge you to protect and preserve your vision at all times.
Dr.: .....

FIGURE 4

This Test was merely one to determine your present visual performance for your present job and not a complete visual analysis.
Do not disregard any feeling of discomfort or blur in your vision—your eyes may be trying to warn you. See your doctor for a complete visual analysis when these conditions become apparent.
Your next visual performance test will be on....., or at any time that you may desire.
Dr.: .....

FIGURE 4A

to meet the necessary requirements should be given a referral card which he or she is to present to the examining doctor.. This card is to be returned by the employee after the doctor has completed his analysis and recorded the necessary information. (Figures 5 and 5A.)

From this article and this study, four definite conclusions can be drawn:

1. Industry must continue to provide hardened safety lenses for the protection of its employees' eyes.

Company's Name:
City and State:

Name: ..... Date: .....
Department: .....
General Working Distance: .....
Critical Working Distance: .....
Type of Lenses Recommended for Best Efficiency: .....
Bifocals: ..... Type: ..... Trifocals: ..... Double Segs: ..... Tint: .....
Work in Motion: ..... Work Stationary: .....
Protective Eyewear: .....
Dr.: .....

FIGURE 5

Dear Doctor:

This employee has received our visual performance test in the best interest of welfare, safety, and efficiency, has been referred to you for a complete visual analysis. Your remarks and suggestions as to the true condition will be greatly appreciated.

V.A. without Rx.			V.A. with old Rx.			V.A. with new Rx.		
20 / O.D.	20 / O.S.	20 / O.U.	20 / O.D.	20 / O.S.	20 / O.U.	20 / O.D.	20 / O.S.	20 / O.U.

Remarks of Condition and Correction Given: .....

.....

Rx. for Safety Glasses

	Sph.	Cyl.	Axis	Prism	Base
R. Eye					
L. Eye					
Add					

.....
.....
.....
.....
Signed: Dr.

FIGURE 5A

2. Industry must use some screening instrument for pre-employment and periodic visual efficiency tests.

3. All work pertaining to visual safety and efficiency must be placed in the hands of the professional eye-man.

4. If this program is operated conscientiously, the effects of the efforts expended will provide increased personal comfort and productive efficiency.

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EDITORS AND STAFF

Dr. Carel C. Koch ..... *Editor*
Dr. J. Fred Andreae ..... *Associate Editor*
Dr. Arthur P. Wheelock ..... *Associate Editor*
A. Virginia Huck ..... *Editorial Assistant*
Harry Brookins ..... *Advertising and Production Manager*
L. L. Koch ..... *Circulation Manager*

Publication and Academy Office: 1502 Foshay Tower, 821 Marquette Ave.
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REFRACTION FEES AND TODAY'S LIVING COSTS

When the question of proper refraction fees is raised, one is apt to get a wide range of opinion on the subject. Some optometrists believe in making only one flat fee for both the refraction and the auxiliary services as well as the ophthalmic material which they dispense. Others have a fixed fee for the refraction and add to this the cost of materials plus a normal servicing fee for dispensing these. In any event, the fees and charges are governed by (1) the class of patients served; (2) the type of service rendered by the optometrist; and (3) the current value of the dollar. Unless all three of these factors are taken into considera-

tion the optometrist is apt to find himself without adequate returns for the professional service he renders.

Obviously, an optometrist who draws most of his patients from that group of the public in the lower income brackets must of necessity keep his fees and his fixed cost of maintaining his practice at a lower level than the optometrist whose practice comes from families in the upper middle income brackets. The latter patients demand more "swank" from their professional men and expect to pay for same.

As to the type of service rendered, this is largely up to the optometrist himself. No one knows better than he the type of refractive work he is doing. If he is giving his patients real visual care and if he is exerting every effort to do the finest possible job of eye-examining his conscience is clear when he charges an adequate fee for his professional services, and optometrists everywhere who are doing this are experiencing no difficulty in receiving these fees. The public expects to pay for examinations and is perfectly willing to pay for good ones in fees high enough to compensate the optometrist for his skill, knowledge, and all around professional ability.

The third factor now comes into the picture, this being the value of the dollars collected by the optometrist for the services rendered. Professional fees once established are not easy to alter, yet economic changes make it necessary at times for optometrists to study this factor of their professional lives to detèrmine whether or not their fees are in proper relation to the current living costs, because an optometrist must live as well as practice. Not only must he pay his office bills but he also must live properly in the community as a professional man, and in addition to paying these costs, must put aside something each month for use during that period later in life when he will have less desire for the crowded appointment sheets of today. In average times this "cost-of-living" ratio is of little concern to the optometrist. The changes which come, both "up" and "down" are so gradual and cover such relatively narrow range that his rather fixed fees enable him to get along nicely. Today, however, this is changed. Living costs which include rent, services, supplies, clothing and food, all are increasing rapidly and may make the adequate refraction fee of 1941 inadequate today. For instance, a $5.00 refraction fee of 1941 is actually only a $3.33 fee today when the $5.00 is measured in terms of buying power.

Since 1941 living costs have increased as follows:[1] December 8, 1941, to September 30, 1943—19 per cent. October 1, 1943, to June

[1]U. S. Department of Labor, Bureau of Labor Statistics figures, July 15, 1946.

30, 1946—12 per cent. July 1, 1946, to July 15, 1946, at least 19 per cent. This makes a total of 50 per cent. In other words, the $5.00 refraction fee of 1946 only buys as much today as did $3.33 on December 8, 1941. Now if the optometrist is doing only the same number of examinations today as he did in 1941 his real income is cut by one third. The war period, to be sure, increased the total practice volume done by all optometrists quite materially and this has been a factor which enabled them to absorb these increased living costs as these came about. While the purchasing power of his dollar shrank he got more dollars through a larger volume of patients and things seemed "all right." Now, however, with costs going higher and higher the optometrist is faced with the problem of (1) increasing his total volume of refractions; (2) charging more for his professional services; or (3) reducing his living standards.

The matter of rapidly increasing one's total number of patients ethically is out of the question. Reducing living standards is also inadvisable and the optometrist of today is therefore faced with the problem of getting adequate compensation for the services rendered. In other words, his professional fees must be somewhat increased to offset increased living and professional office costs. This he can do and should do at once. Today the greatest professional health bargain in America is an ocular refraction at the hands of a modern competent optometrist. Fees—always low—are today far too low and an across-the-board increase in those professional charges is warranted.

A. VIRGINIA HUCK

TRANSACTIONS OF THE AMERICAN ACADEMY OF OPTOMETRY

A department devoted to announcements, reports, appointments, organization data, news professional problems and ideals, as these relate to the Academy.

PLANS FOR COMING ACADEMY MEETING IN PHILADELPHIA

The Program and Arrangements Committees of the American Academy of Optometry have been working for several months on the coming Academy meeting at Philadelphia, December 1, 2, 3 and 4.

Dr. J. Fred Andreae, President of the Academy, has been working with a group of Philadelphia members and the Bellevue Stratford Hotel has been selected as headquarters. The announcement will be made at a later date regarding reservations.

Dr. D. G. Hummel, Chairman of the Program Committee, has already arranged for the presentation of a number of papers, and the section chairmen are now preparing the programs for the sections on orthoptics, pathology, contact lenses and aniseikonia.

Dr. Hummel reports that he has places on the program for several additional papers and Fellows of the Academy who wish to present papers should get in touch with Dr. Hummel at once.

One day of the convention period will be spent on the Pennsylvania State College of Optometry campus.

Fellows of the Academy are urged to now reserve these dates and make the proper plans to be present at Philadelphia for the Silver Anniversary meeting of the Academy.

A. VIRGINIA HUCK

LOCAL CHAPTERS

The Vermont Chapter met at Rutland, June 10. The President, Dr. E. Craig Wilson, presided and Program Chairman, Dr. G. F. Preston, introduced Fellow Dr. Douglas F. Green of Burlington who presented a paper on "Radiant Energy and Its Effects Upon Cataract." Much helpful discussion followed. The next meeting of this Chapter will be August 11.

The Indiana Chapter held a luncheon meeting in the Terre Haute House, Terre Haute, June 10. Fifteen optometrists were present. President Dr. I. M. Borish presided. A short discussion of Chapter problems as well as malpractice insurance followed the meeting.

The Southern California Chapter met at the Los Angeles Athletic Club, June 14. The President, Dr. Ernest A. Hutchinson, presided. Dr. John R. Dean led the evening's discussion which had to do with visual handicaps of school children and remedial reading.

RESEARCH IN COLOR VISION SUPPORTED BY THE GRANT-IN-AID BY THE AMERICAN ACADEMY OF OPTOMETRY

The purpose of the investigation to be conducted by Dr. Glenn A. Fry, is to determine:

1. The color-mixture data, chromaticity discrimination data and luminosity curves for a 2° foveal region in anomalous trichromats. More data of this sort is needed to supplement the data available before the characteristic deviations from normal color vision can be defined.

2. To determine the color-mixture data, chromaticity discrimination data, and luminosity curves for different conditions of adaptation, and for regions of the retina surrounding the fovea.

This investigation which will be conducted in The School of Optometry, Ohio State University, has practical value for designing tests for color blindness. It is well known, for example, that changing the distance of the Ishihara charts affects the results. That is to say, a better performance is obtained when the whole pattern can be included in the fovea at one time. A preliminary investigation has indicated in anomalous trichromats that two factors are involved. One is a variation in the luminosity curves in foveal and parafoveal regions, and secondly, a reduced discrimination of chromaticity in the periphery.

This investigation will have theoretical value in that:

1. It will provide a clearer picture of the specific things that are abnormal about dichromats and anomalous trichromats, and
2. It will contribute to the ultimate solution of the nature of the mechanism of color vision.

The ultimate value of such an investigation to optometry does not consist in the solution of problems of color vision and color-blindness per se, but in the fact that a basic understanding of binocular vision (fusional movements, stereopsis, fusion and rivalry of colors, amblyopia, exanopia, anomalous correspondence) is not possible till a solution is found to the problem of how color impressions are initiated at the retina and transmitted to the cortex.

The equipment essential to this investigation will eventually cost in the neighborhood of $3,000 and will include:

1. Two double monochromators for obtaining two separate mixtures of two or three components each.
2. Devices for controlling the intensity of the separate components, and the intensities of the two mixtures as a whole.
3. A photometer cube with a bipartite field.
4. A spectrometer for calibrating the wave length scales of the two monochromaters.
5. A thermopile and accessories for measuring the radiant energy of the stimuli.

The initial grant of $1000 made by the Academy will be applied toward the purchase of the following items, which will become the permanent property of the School of Optometry: One large wave length spectrometer. One vacuum thermopile. One bilateral slit. One mount-

ing for thermopile. One galvanometer. One nicol prism. One Wollaston prism.

NOTES FROM AN INTERIM REPORT OF SECRETARY

Current records in the Office of the Secretary of interest to Fellows of the American Academy show that during the first six months of 1946, twenty-six names were added to the Academy roster including those of optometrists, educators and scientists.

During this same period the Academy lost two members through death, these being Dr. G. O. Ohlsson, Detroit, Michigan, and Dr. Max Poser, Rochester, New York.

Four members have been dropped because of non-payment of dues, and the cases of five optometrists are now before the Executive Council for possible disciplinary action for infractions of Academy by-laws. In two of these cases the location of the optometrist's office is under investigation. Another optometrist has been charged with engaging in display advertising and improper itinerant practice. In the fourth case it is alleged that the optometrist has practiced medicine without a license, and the fifth and final pending case indicates there may have been infractions of State licensing regulations.

A. VIRGINIA HUCK.

SPECIAL REPORTS

THE SHEARD FOUNDATION FOR EDUCATION AND RESEACH IN VISION

IN THE GRADUATE SCHOOL, THE OHIO STATE UNIVERSITY

In closing his presentation on "Some Considerations Concerning Ophthalmic and Optical Education and Training," Dr Sheard gave some account of the founding and the purposes of the Foundation for Vision, and pointed out why it is so essential that there be developed in an outstanding state university with a graduate school as well as a medical college, and which is geographically located in the middlewest and near the center of population of the United States, a great center of education and research in vision. As he pointed out, the movement which culminated in the creation of the Sheard Foundation for Education and Research in Vision at the Ohio State University had its beginnings many years ago. In fact, the very first step in the movement

dates back to the introduction of the courses in Applied Optics in 1914. During the thirty years that have come and gone, various important events have occurred. There have been created or established a Board of Certification in ophthalmology, four and five year courses in optometry, and special developments, such as the work in aniseikonia at Dartmouth College. All of these and similar advances on the part of practitioners and educational institutions alike have very naturally led to a consideration of the development and establishment of a great center in some university in which there could be carried on research concerning all phases of vision, in which there would be postgraduate instruction, and in which men and women from the fields of anatomy, physiology, physics, psychology, medicine, and particularly ophthalmology, optometry, optics, illuminating engineering, and others interested in vision, might be adequately trained and become the possessors of graduate degrees and, in turn, become the teachers, professors and research specialists of the future, or assist in the development of the scientific phases of the optical industry. Furthermore, and last but not least, that there would be associated with such a Foundation men who were capable leaders, with the ability to exercise the finest type of leadership in all things concerning vision, without let or hindrance, with no restrictions other than the necessary educational qualifications, with hands and hearts devoted to the development of the arts and sciences concerned with vision and their applications to any and all problems of vision.

Letter from the President of The Ohio State University: A letter from Dr. Howard L. Bevis, the President of The Ohio State University, under date of May 29, 1944, clearly sets forth the acceptance of the Foundation by the University, its main objectives, its administration, and the use of its endowment funds. The letter is as follows:

> "I have been asked to clarify the attitudes and responsibilities of the Ohio State University with respect to the proposed program of research in vision.
>
> "For many years The Ohio State University has been interested in the development of a center of research on the fundamental nature of vision and its conservation, without reference to special professional interests and practices. The objectives of such a program would be: (a) to stimulate and maintain a research program on visual problems, both theoretical and practical; (b) to train teachers and research workers on the post-graduate level for the professions and the industries; and (c) to exercise a leadership in visual education and practice in the public interest.

"For some time The Ohio State University Development Fund has been actively engaged in raising funds for this project under the name of the Sheard Foundation for Research in Vision. When sufficient funds are available, this research program will be organized and allocated to the Graduate School where it will be administered by the Dean of the Graduate School, Director and Professorial Staff of the Foundation in cooperation with an advisory committee representing visual research interests in such sciences as anatomy, physiology, pathology, psychology, physics, ophthalmology, optometry, and illuminating engineering.

"The staff of the Foundation will consist of full-time research professors and investigators, lecturers, research fellows, and technicians. They will have access to the libraries, laboratories, and research facilities of the University on the same basis as other members of the university staff. The research program of the Foundation will concern itself with fundamental problems related to the anatomy, physiology, and pathology of the eye and of vision; to the various parts of the nervous system concerned with vision; and to the physiological optical and psychological aspects of vision. There will also be investigations of practical problems related to eye examinations; corrective devices and procedures; visual standards; reading difficulties; vision in schools, industries, and aviation; and color in art and industry and other researches germane to vision.

"Funds given to the endowment of the Sheard Foundation will be deposited with the treasurer of the state of Ohio and will be specially earmarked for this research program. Article I of the Constitution of the state of Ohio provides that funds deposited with the state of Ohio for educational purposes shall forever be preserved inviolate and undiminished, and the income arising therefrom shall be faithfully applied to the specific objects of the original grants, or appropriations. At present such funds draw 6 per cent interest. Monies given for purposes other than endowment will be used as specified by the donors.

"Any assistance that anyone interested in these important problems of vision can give the Development Fund in raising monies for the endowment and maintenance of this important research project will be highly appreciated."

Purposes and Functions of the Foundation: The purposes and

functions of the Foundation may be concisely and clearly stated as follows:

1. To develop postgraduate training and research in the broad field of vision, both theoretical and applied.

2. To develop teachers and research workers in vision and for various professional and industrial needs and requirements.

3. To stimulate research in every way possible insofar as visual problems are concerned.

4. To be concerned with and to lend support to and exercise influence in programs of undergraduate training in visual science and the further development of adequate professional courses and curricula.

5. To support, edit and contribute to a journal devoted solely to visual science.

6. To engage in and support the preparation of textbooks and treatises on various phases of vision and visual science.

7. To engage in the preparation of materials to convey to the public correct information regarding eyes and eyesight.

8. To exercise a leadership in all matters of an educational or research character in vision, to the end that the Foundation for Vision may contribute the greatest good to the greatest number possible.

Types of Investigation: Some of the chief investigations or fields of research which are now being carried on under the supervision of the Foundation, or which will be enhanced whenever sufficient funds are available, are concerned with

1. Color vision.
2. Recognition training.
3. Accommodation and convergence.
4. Subnormal visual aids.
5. Standardization of ocular tests.
6. Development of the eye and of visual functions.
7. Photophobia.
8. Ocular fatigue.

Editorial Comment: In a recent editorial (*American Journal of Ophthalmology*, March, 1944) Dr. W. L. Benedict, after reviewing the movement which culminated in the establishment of the Foundation and after commenting on the necessity of adequate professional schools, wrote:

> "It has long been recognized that research in all phases of visual science is proceeding in a number of schools and laboratories with results that justify continuation of the work. The

objectives of the studies may be clinical, psychological, physiological, economic, sociological, or commercial. Whatever of good results from these bits of isolated researchers should be planned and preserved for application where they can be best employed. A central processing and proving station is required to evaluate the results of such studies as are carried on there and elsewhere, and it is just that purpose that is to be served by the Sheard Foundation. In order that there may be adequately trained teachers in the things of vision, whether they go as teachers or research workers into ophthalmology, optometry, illuminating engineering ,visual direction in industry, physico-physiology, psychology, or some other branch of learning, there must be some center possessed of adequate medical and other collegiate departments and a conviction about and interest in matters of vision.

"The purposes of the Foundation are laudable and the character of its formation and sponsorship unimpeachable. With a competent staff and adequate financial and moral support from medical as well as lay sources it promises to fill the needs so sorely felt at the present time by all groups of professional men who are endeavoring in their own way to relieve distress of sufferers of visual disturbance, or to aid by scientific research and application the lessons learned by researchers in applied optics. The Foundation deserves the moral and financial support of all those who are in any wise interested in, or concerned with vision."

Points of Interest About Foundation: In connection with this million dollar project in the interests of the Sheard Foundation for Research in Vision at the Ohio State University, the following points are of particular interest:

1. Any funds contributed immediately become a part of the permanent endowment of the Foundation, which is, in turn, a part of the Ohio State University.

2. These monies are earmarked and set aside in the Treasury of the State of Ohio, and the proceeds therefrom are to be used only according to the wishes and expressed desires (whenever stated) of the donor.

3. Monies and support for buildings and housing facilities have not been solicited, on the basis that the State of Ohio, through its university, has made some provision for and will adequately care for the physical needs of the Foundation through its own channels. Any

and all parts of the university are at the disposal of the Foundation. Hence all monies for endowment go into the things of brains and not bricks.

4. All such monies for endowment and placed in the Treasury of the State of Ohio draw interest at the rate of 6 per cent per annum (as stated in the letter of President Bevis).

5. A sound investment which yields 2.5 to 3 per cent is considered satisfactory today. Since the State of Ohio pays 6 per cent return on funds invested with it for educational purposes, it is clear that the State, when it accepts any such endowment funds, to all practical purposes and insofar as interest rates are concerned today, adds an equal amount of principal and therefore matches the donor dollar for dollar. So the State of Ohio becomes co-partner and on an equal financial basis in all such undertakings.

Financial Support: As has been stated, this nation-wide million dollar undertaking for the endowment of postgraduate training and research in vision, like all other undertakings, had its beginning during the period of the depression. During those days, and the subsequent years of war, considerable progress was made both in the securing of funds and in fostering and carrying on research. But the exigencies of war, of necessity, diverted attention in large part from such peace-time pursuits and educational programs. With the cessation of the war, however, there comes returning interest and support to the end that this larger and more pretentious and absolutely necessary program may be consummated and made a reality. There are now total pledges and contributions, which are a part of the endowment of the Sheard Foundation or, in turn, which will become available to it, to an amount over a hundred thousand dollars. This total is made up of several individual pledges and contributions of from five to ten thousand dollars, amongst them being the establishment of a memorial library in visual science. The large manufacturing optical companies are planning to support, in a liberal manner, the establishment of the professorships and the endowment for the permanency and continuity of service of the Foundation. Other groups of men interested in optical manufacturing and, in particular, in the specialties of ophthalmic goods have already started to make contributions of from ten to twenty-five thousand dollars each, thereby establishing scholarships, fellowships, research equipment funds, and have a definite designation of the fellowship that is being established by them and, therefore, bearing their names.

VERMONT CHAPTER—AMERICAN ACADEMY OF OPTOMETRY*

CONSTITUTION

Art. 1. NAME. This group shall be known as "The Vermont Chapter of The American Academy of Optometry."

Art. 2. OBJECT. The object of this Chapter shall be to promote the development of optometric service and the conservation of human vision by encouraging its members to bring before its meetings for discussion: matters of common interest experienced in their individual practices; reports of problems or unusual cases; the results of individual studies in the art and science of optometry, and papers prepared by its membership.

Art. 3. OFFICERS. The membership of this Chapter shall consist of those residents of Vermont who are members in good standing of the parent body, The American Academy of Optometry. Fellows of the American Academy, wherever resident, are welcome to attend and participate in the meetings of this Chapter.

Art. 5. AMENDMENTS. This constitution may be amended at any annual meeting of the Chapter by a majority vote of those present providing not less than two-thirds of the membership is present at the meeting, or in the event of insufficient attendance, by an affirmative vote conducted by mail, a majority vote being required. All amendments, proposed or adopted, are subject to the approval of the parent body.

BY-LAWS

Sec. 1. DUTIES OF OFFICERS. The President shall preside at all business sessions of the Chapter, shall be chairman of the official body, shall appoint any committees which may be deemed advisable and shall otherwise perform such duties as are usually required of a presiding officer.

The Vice-President is to assume the duties of the President in his absence, or at his request, and is to serve as a member of the Executive Committee.

The Secretary-Treasurer shall keep a record of all business transacted by the Chapter, shall receive and disburse funds as instructed by the President or by vote of the Chapter, shall record a brief summary

*Constitution and By-Laws of the Vermont Chapter of the American Academy of Optometry were adopted in Rutland, Vermont, April 15, 1946.

of the activities of each business or educational meeting and report such meeting to the National Secretary as required by Charter. He shall mail notices to members of the date and place of each meeting, one to two weeks in advance of said date, giving program information concerning said meeting also. He shall perform the usual duties of clerk and accountant for the Chapter and also serve as a member of the Executive Committee.

The Program Chairman shall preside at the program sessions of the Chapter, or select a substitute if he is unable to be present, and shall arrange for the material of the program for each meeting. He is also to serve as a member of the Executive Committee.

The Advisory Member is one elected to serve with the four preceding officers to form an Executive Committee of five members in whom shall be vested the management of the affairs of the Chapter, between annual meetings.

Sec. 2. ELECTIONS. The annual business meeting of the Chapter shall be the first meeting held in each calendar year. The terms of the officers shall be for one year or until their successors are chosen.

Sec. 3. MEETINGS. The Chapter will meet four times each year at such time and place as the members may choose providing that, if no choice is stated for any meeting, the meetings are to be held on the second Monday evening of April, June, August and October. The place for each meeting may be chosen by the members at a preceding meeting, or if no choice is made, may be determined by the official body. A minimum of two meetings each year is required.

It is the intent of this Chapter that programs be rotated, viz., that each member in alphabetical order, is to be held responsible for the main program feature of each meeting. He may either present a paper of his own preparation, may provide for a speaker as substitute or otherwise bring to the meeting assigned him an informative program of value and assistance to professional practitioners of optometry.

It is further intended that it is not the purpose of this Chapter to discuss matters of economic concern nor in any way duplicate the work of the Vermont Optometric Association. The programs of this Chapter are to be educational, instructive, uplifting and of assistance to the skill and mental growth of its membership.

Sec. 4. DUES AND ASSESSMENTS. It is expected that the per-member refund of dues from the parent body may be sufficient to finance the minor items of expense of this Chapter. However, should such refund fail to do so, the Chapter may at any of its meetings vote

an assessment upon its members, said assessments not to exceed five dollars per year for each member.

Sec. 5. DUTIES OF MEMBERS. While the Constitution specifies those who are now members, or may later become members, of this Chapter, it shall be the duty of members to seek additional individuals to qualify for membership in the parent body in order that those residing within Vermont may thus automatically become members of this Chapter.

Knowing of a fellow's failure to maintain the standard of practice required by the parent body, a member is required to report such default to the Secretary of this Chapter and said Secretary shall make an effort to obtain correction of the default by personally taking up the matter with the accused member. Should the default continue, the Secretary of the Chapter is required to report the matter direct to the National Secretary of the parent body, who in turn is asked to refer the matter to the Executive Council for consideration.

Sec. 6. AMENDMENTS. These By-Laws may be amended at any annual meeting of the Chapter in the same manner, and subject to the same approval of the parent body, as are amendments to the preceding Constitution to be handled.

OFFICERS for 1946: Dr. E. Craig Wilson, President; Dr. Douglas Green, Vice-President; Dr. L. P. Folsom, Secretary-Treasurer; Dr. Gerald F. Preston, Program Chairman; Dr. Katherine Jordan, Executive Committee.

ANNOUNCEMENTS

NEW EQUIPMENT FOR HARDENING SPECTACLE LENSES

Ophthalmic lenses can now be quickly hardened in a new Bausch and Lomb Optical Company unit. This electric furnace eliminates some of the variables which formerly made the hardening of ophthalmic lenses a difficult matter. With this new equipment the lens is automatically raised into the furnace, heated, lowered, and cooled, in a few minutes time, the exact period depending on the weight of the lens to be treated.

The process is a simple one consisting of two principal operations. (1) The lens must be heated to a temperature above its strain temperature but below its softening point. (2) It is then quickly cooled. Simple

as this process may sound, exacting controls of all its phases are necessary to obtain the maximum hardness. The furnace must heat the lens above its strain temperature but not above its softening point. In order to apply the precise amount of heat, the control of the heating cycle must take into account the temperature of the furnace, the weight of the lens, type of glass and its surface area. Control too must be exercised over the cooling cycle. The cooling must be uniform and rapid to secure a high degree of strain. To a large degree the new unit is automatic, and the lenses are hardened to meet U. S. Government standards for hardened industrial lenses. The process is of value in hardening lenses for children, industrial users of spectacles and for those patients who wear glasses while engaged in some sports.

HANDBOOK ON RELATIONSHIP OF LIGHT AND SIGHT NOW AVAILABLE FOR DISTRIBUTION TO SCHOOL TEACHERS

To help teachers to give their classes the facts about better lighting and its relationship to eye health and comfort, the National Education Association has prepared an 80-page manual entitled "Teaching About Light and Sight," which is now ready for distribution to elementary and secondary school teachers.

Emphasizing the importance of early instruction in light and sight, the book states that "the person who wants and knows how to have a well-lighted home has added to his effectiveness as a member of the family. If he appreciates the importance to the community of good lighting on streets, in schools and other public buildings, he is unlikely to be an obstructionist when improvements are considered."

Formation of intelligent seeing habits may be started as early as the third grade, the manual states.

Opening with a brief description of the working of the eye, the book then discusses the nature of good lighting, measurement of light, and incandescent and fluorescent lamps. Proper selection, use and maintenance of fixtures are treated at length.

Lighting problems of the home and classrooms are considered, with detailed tables of illumination levels recommended for specific seeing tasks. The importance of adequate wiring is pointed out.

Methods and devices for teaching proper eye care to pupils are listed, and a suggested curriculum of topics shown.

The booklet closes with a bibliography of books on lighting and

seeing, periodicals dealing with these topics, and agencies supplying information and materials.

The booklet was prepared with the assistance of many authoritative groups and individuals in the educational, medical and health fields, technical societies and the National Better Light - Better Sight Bureau. It will have a lasting effect on hundreds of thousands of pupils, and may well be one of the most important steps ever taken in the field of lighting education, says Harry Restofski, Chairman of the Better Light - Better Sight Bureau.

"Teaching About Light and Sight" is available from the National Education Association, 1201 Sixteenth Street, N.W., Washington 6, D. C. Prices of single copy, 30c. In quantities at variable discounts.

ANNUAL SEMINAR ON READING DISABILITIES

The 1947 Annual Seminar on Developmental Reading will be conducted February 3 to February 7, 1947, inclusive, by the Reading Clinic Staff, Department of Psychology, Temple University, Philadelphia 22, Pennsylvania. Lectures, demonstrations, and discussions will be used to develop the central theme: *Differentiated Corrective and Remedial Reading*. Program available, September 15, 1946.

Topics for successive days are: Approaches to Analysis of Reading Disabilities, The Analysis Program, Case History, Social and Emotional Correlates, Physical and Neurological Factors, Capacity for Reading. Reading and General Language Achievement, Classification of Reading Problems, Remedial and Corrective Procedures. The activities of the Institute will be differentiated to meet the needs of classroom teachers, remedial teachers, school psychologists, supervisors, administrators, neurologists, and vision specialists.

Nationally known specialists in reading and related fields will conduct the seminars and demonstrations.

Enrollment is limited by advanced registration. For copies of the program and other information regarding this one-week Institute, write to Dr. Emmett Albert Betts, Reading Clinic, Temple University, Philadelphia 22, Pennsylvania.

FEINBLOOM CONTACT LENS COURSES TO BE HELD ON WEST COAST

Dr. George J. Hellinger, optometrist, attached to the Technical Staff of Feinbloom Contact Lenses, is leaving for Los Angeles where

he will conduct a course on the fitting of Feincone Contact Lenses, starting August 11th. After leaving Los Angeles he will conduct another course in San Francisco on August 25th. Dr. Hellinger is a graduate of the University of California School of Optometry. He has spent considerable time in Los Angeles and San Francisco and has travelled the country as instructor and consultant in the fitting of Feincone Contact Lenses.

GAMMA OMEGA PHI FRATERNITY TO MEET

The past few weeks have brought about considerable activity within the fraternity and our National Alumni Organization.

Officers of Gamma Omega Phi were elected for the forthcoming fiscal year. They are as follows: Paul Kaplan, Chancellor; Lester Glaser, Vice Chancellor; Morton Heller, Scribe; Roy Soloff, Exchequer; and Stanley Herberts, Keeper of the Inner Portals.

Plans are now being made for a grand reunion of the Alumni Association. This event is scheduled to take place in Philadelphia, the week-end of September 21st, 1946. We have tried to contact all fraters by mail, some letters were returned to us due to a change in address. All brothers who have not been contacted are requested to get in contact with the fraternity by writing to us in care of Pennsylvania State College of Optometry, 12th and Spencer Avenue, Philadelphia, for full particulars.

J. MORTON HELLER.

ABSTRACTS

A department in which will appear abstracts of the literature of optometry, ophthalmology and applied optics. These will be classified according to the following list although contributions to all sections will not necessarily appear in each issue.

1. Ocular Refraction.
2. Physiological Optics and Color Vision.
3. Ocular Muscles.
4. Orthoptics and Reading.
5. Anatomy, Histology and Embryology.
6. Ocular and General Pathology.
7. Ophthalmic Lenses and Material.
8. Instruments.
9. Hygiene and Illumination.
10. Applied and Physical Optics.
11. Education, Sociology and Economics.
12. Miscellaneous.

2. PHYSIOLOGICAL OPTICS AND COLOR VISION

THE IMPORTANCE OF DISTANCE EXOPHORIA HAS BEEN OVERLOOKED. L. A. Swann. The Canadian Optometrist, 1945, September, 152-154.

Swann urges greater use of the cover test. The optometrist experienced in using this test will receive diagnostic information of value in all

cases of heterophorias by this means which will supplement the data supplied by the phoria and duction tests. In addition Swann claims the reaction of the eyes after the cover is removed will indicate whether or not orthoptics may be helpful to the patient. If the fusion redress is fast, Swann claims, orthoptics will be of little value. If slow, orthoptics will likely assist the patient in regaining higher visual efficiency.

A. V. H.

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6. OCULAR AND GENERAL PATHOLOGY

THE PRIMARY CAUSE OF GLAUCOMA. O. Meyer. Eye, Ear, Nose and Throat Monthly, 1945, 24, 12, 586-587.

Focus of infection in the tonsils and oral cavity frequently cause an infection of the jugular vein which in turn prevents sufficient drainage of the venous blood from the head. As a result a venous congestion of the head is present which in turn will tend to increase the pressure within the eye, particularly in patients who are predisposed to glaucoma. Meyer presents his therapeutic relief from jugular phlebitis.

C. C. K.

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8. INSTRUMENTS

THE SCOTOMETER AND CAMPIMETER. Max Poser. Optical Journal and Review of Optometry, 1945, 82, 23, 29.

Instruments used in central field charting are reviewed by Poser. Regarding the use and construction of the Bardsley scotometer he points out that it consists in large part of a section of a hollow sphere mounted on three small wheels in a frame so that it may be revolved about its own center. In the center of this section, corresponding to the fixation point, is a small opening. Extending from this opening to the edge is a narrow slot. Through this slot the test object is moved and a scale, parallel and close to the slot, shows the angular movement of the object in degrees from the center. A circular scale surrounding the hollow section shows the position of the slot, whether vertical, horizontal or at any intermediate position. The disc is revolved about its axis by means of a friction wheel which secures smooth rotation and without bringing the operator's hand into view of the patient.

In using the instrument, the patient faces into the dull-blacked section of a hollow sphere—a miniature Bjerrum's screen—with a central fixation disc. There is nothing moving besides the test object; no

carrier to reflect the light or to make a noise, nothing to distract the patient. Through the fixation spot of the spherical section there is a minute hole. Through this the examiner can watch the eye of the patient continuously and can immediately allow for the slightest deflection on the patient's part.

T. O. B.

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12. MISCELLANEOUS

VISUAL SCREENING IN INDUSTRY—ITS USE AND ABUSE. J. R. Wittekind. Optical Journal and Review of Optometry, 1945, 82, 20, 28-29.

Visual screening instruments should be used under the supervision of optometrists and these instruments have but two uses, (1) to gather data for interpretation by the optometrist leading to the decision as to whether or not the employee requires further visual care in order to achieve his highest potential, and (2) to serve as part of a visual research project in establishing job visual standards, employee placement and selection and similar related fields of industrial eye work.

A. V. H.

A.O.A. POST-WAR PLANNING COMMITTEE REPORT. E. B. Alexander, et al. Optical World, 1944, 32, 9, 18-20.

Two thousand optometrists are in the armed services. To properly return these men to their normal professional lives when the war has finished the A.O.A. Post-War Planning Committee makes the following initial suggestions.—"1. That the professional Advancement Program be continued and accelerated with special emphasis on Ethics and Economics and Public Relations. 2. The creation of active committees in each state, working under direction of the A.O.A., to guide returning veterans and new graduates into professional environment. 3. The preparation and distribution to these placement committees and to the optical supply house branch managers, of manuals of information containing detailed suggestions and information for the beginning and carrying on of a successful professional optometric practice. 4. That the schools and colleges teaching optometry be urged and assisted to strengthen their courses, where necessary, with special emphasis on (1) instruction in the new concepts in ethics and economics in the profession (2) on the instruction of visual training procedures (3) instruction on visual problems

in industry. 5. That our optometric schools and colleges be encouraged and assisted to establish refresher courses of postgraduate instruction for returned optometric veterans, that such postgraduate courses should emphasize (1) the new concepts and trends of ethics and economics in optometry. (2) provide thorough instruction in visual training procedures. (3) instruction on visual problems in industry. 6. That our optometry schools and colleges take further advantage of the opportunity for making careful selection of candidates from among applicants, for admission to the optometry courses. 7. That the state associations and local societies shall encourage postgraduate study group activities to the end that their members may be prepared to meet the economic problems and the responsibilities of the visual needs of a post war America. 8. That the Council on Education and the Association of the Schools and Colleges give consideration to the serious implications and ramifications of conducting any courses deviating from the teachings of optometry or leading to graduation in any other field. 9. That the American Optometric Association give further and intensive study to the problems of visual care arising from projected postwar social and health legislation."

T. O. B.

MODERN OPTOMETRY. M. T. Eberl. The Pennsylvania Optometrist. 1944. 5. 1. 1-3.

According to Eberl an optometric refraction consists first of a complete case history including health, familial, and occupational details; economic, social and recreational factors, and such other matters as seem pertinent. Next an internal and external eye examination is made for the purpose of determining whether or not pathology is present. Then follows the actual visual case study. This involves: phorias at far and near with the old and new corrections, retinoscopy taken at twenty feet and at twenty and forty inches, the subjective or socalled refraction at distance, ductions at twenty feet and at sixteen inches, fused and unfused cross-cylinder findings with the resultant phorias, equilibrium findings (blur out findings), amplitude of accommodation, and vertical phorias far and near. It will be noted, the author points out, that it is no longer considered adequate to take findings at twenty feet and assume operational competency at any point other than twenty feet. The lens that is necessary for near point work differs in many more cases than is generally supposed from the lens indicated at twenty feet.

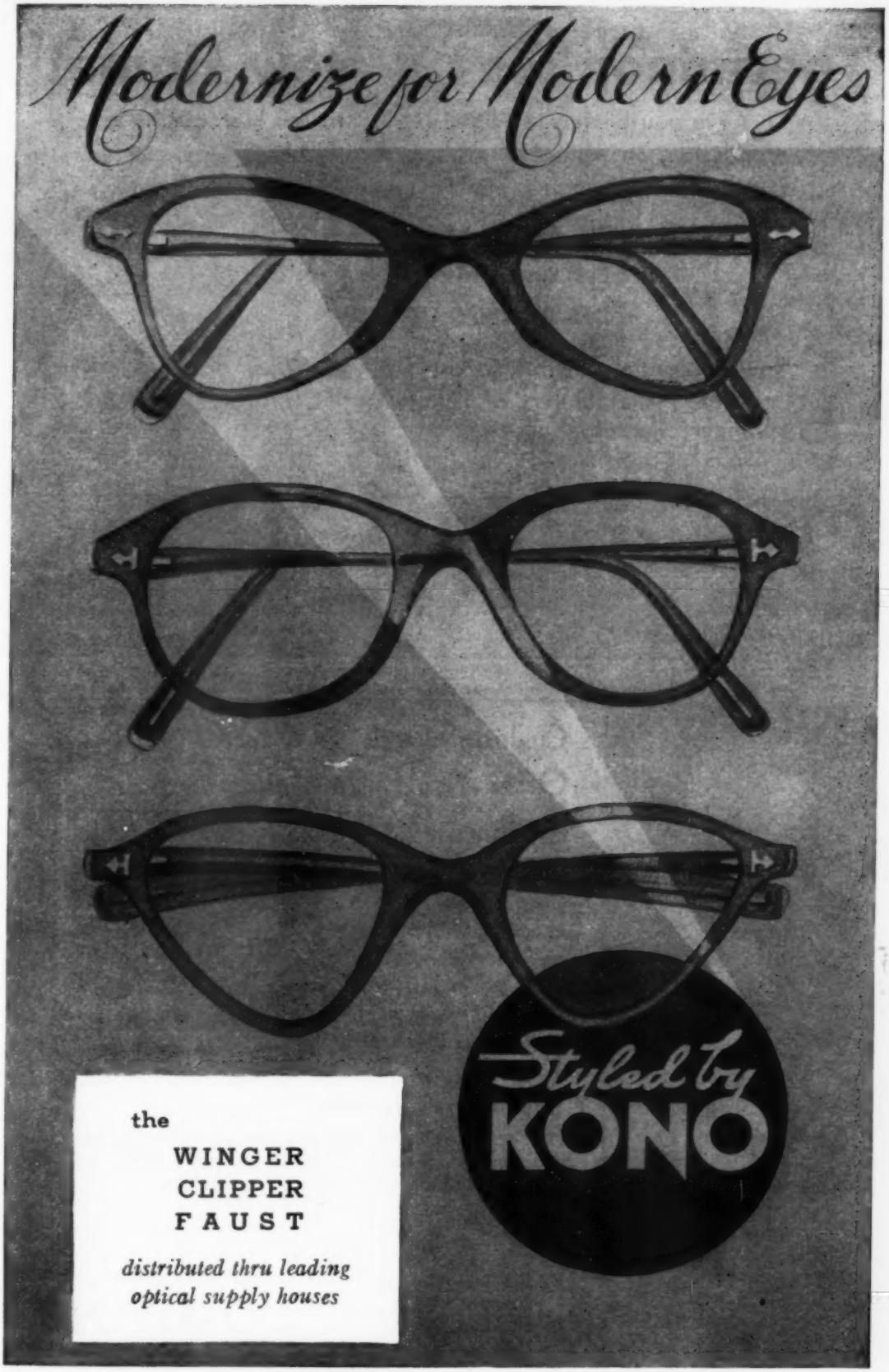
Next, a battery of tests are taken which are at the present time

commonly referred to as investigating the integrity of visual skills. These are: visual acuity far and near; simultaneous perception (first degree fusion); fusion far and near (second degree fusion); stereopsis (third degree fusion); perimacular tests far and near; macular suppression tests far and near; versions, monocular and binocular; perceptual speed and span; fixation ability, far to near and laterally; hand and eye co-ordination tests; accommodative rock.

We should, claims Eberl, then include such other tests as are necessary to complete the case study, such as visual fields and ophthalmograph records. In reading problem cases, such tests as Monroe Silent Reading, Durrell-Sullivan Capacity and Achievement tests, and the Chicago Non-Verbal, all prove helpful when such information cannot be secured from the schools.

This constitutes the optometric visual analysis upon which the necessary corrective procedure is based. When all of this information has been obtained, the optometrist is ready to evaluate the case. The corrective procedure may involve prescribing lenses or instituting corrective visual training, or a combination of both.

T. O. B.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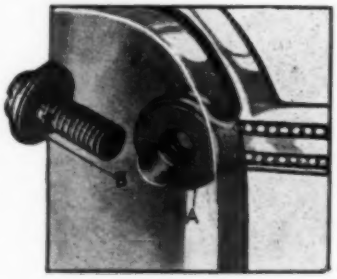

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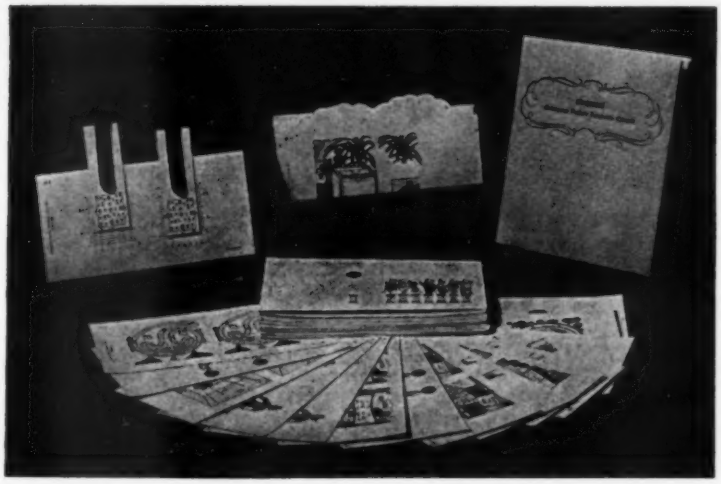

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